ACCEPTED FOODS

and Their Nutritional Significance

Containing Descriptions of the Products Which Stand
Accepted by the Council on Foods of the
American Medical Association
on September 1, 1939

The Seal of the Council on Foods

1939

AMERICAN MEDICAL ASSOCIATION
535 NORTH DEARBORN STREET
CHICAGO

Members of the Council

Franklin C. Bing, Ph.D., Secretary of the Council, American Medical Association, 535 North Dearborn Street, Chicago.

George R. Cowgill, Ph.D., Associate Professor of Physiological Chemistry, Yale University, New Haven, Conn.

Morris Fishbein, M.D., Editor of *The Journal of the American Medical Association,* Chicago, Chairman of the Council.

Philip C. Jeans, M.D., Professor of Pediatrics, University of Iowa School of Medicine, Iowa City.

Culver S. Ladd, B.S., State Food Commissioner and Chemist, Bismarck, North Dakota.

Howard B. Lewis, Ph.D., Professor of Biological Chemistry, Medical School; Director of College of Pharmacy, University of Michigan, Ann Arbor, Mich., Vice Chairman of the Council.

James S. McLester, M.D., Professor of Medicine, University of Alabama, Birmingham, Ala.

Irvine McQuarrie, M.D., Professor of Pediatrics, University of Minnesota School of Medicine, Minneapolis, Minn.

Lydia J. Roberts, Ph.D., Chairman and Professor, Department of Home Economics, The University of Chicago, Chicago.

Mary Swartz Rose, Ph.D., Professor of Nutrition, Teachers College, Columbia University, New York City.

Tom D. Spies, M.D., Associate Professor of Medicine, University of Cincinnati, College of Medicine, Cincinnati, Ohio.

Russell M. Wilder, M.D., Ph.D., Professor of Medicine, Mayo Foundation, Mayo Clinic, Rochester, Minn.

Preface

Accepted Foods is a book in which are described the products which were on the list of accepted foods on Sept. 1, 1939. These products have been classified into several categories, and the order in which the discussions appear is one of convenience only. In general an attempt has been made to list classes of foods and other items in alphabetical order. In addition to descriptions of the products, the book provides the Council's opinion regarding many topics in the field of nutrition. The book includes the rules and regulations of the Council and general decisions pertaining to food composition and nutritional claims which may appear in advertising of food products.

It should be emphasized that a book of this type will very likely be somewhat out of date by the time it is published. For this reason, frequent revision of the book will be necessary and plans are being made to revise the volume in the light of newer knowledge from time to time.

It also should be understood that the accepted products are simply those which have been submitted to the Council for consideration and have been found to be satisfactory in composition on the basis of evidence supplied by the manufacturer or independently secured by the Council, and to be promoted with claims that are in accordance with the rules and policies of the Council on Foods.

Acknowledgement is made in this first compilation of data to the information that has been freely placed at the Council's disposal by many firms and consultants. Acknowledgement is made also to the services of the former secretary, Mr. Raymond Hertwig, and the following former Council members:

Dr. E. M. Bailey	Dr. W. McKim Marriott
Dr. Joseph Brennemann	Dr. Lafayette B. Mendel
Dr. Eugene F. DuBois	Dr. Grover F. Powers
Dr. Julius H. Hess	Dr. H. C. Sherman
Dr. Edwin O. Jordan	

The Council also is indebted to Dr. Ruth Cowan Clouse, Mrs. Leone Finnie and other members of the headquarters staff who have actively participated in the preparation of the present volume under the direction of the Council. Particular appreciation is extended to the careful editorial supervision of the present volume by Dr. Harriet Morgan Fyler, of the headquarters staff.

FRANKLIN C. BING, Secretary.

Contents

SECTION I

Work of the Council on Foods

History and Purpose. The advances in the newer knowledge of nutrition during the past two decades have been spectacular and far-reaching in their human applications. Food manufacturers and advertising agencies have been alert to make use of this interest and knowledge. Health claims have appeared in the advertising of many food products; some of these claims were true, but many were not based on adequate scientific evidence. It seemed to the Board of Trustees of the American Medical Association that an authoritative body was needed to evaluate nutritional claims in the advertising of food products, much as the Council on Pharmacy and Chemistry reviews therapeutic claims for drugs, and thus in 1931 they created the Committee on Foods. This committee first functioned as a small subcommittee of the Council on Pharmacy and Chemistry. Later it was increased in numbers and organized as a separate committee and, in 1936, the name was changed to the Council on Foods.

The Council is now composed of twelve persons selected because of their knowledge of those branches directly concerned with food composition, nutrition, and health. To assist the Council members and facilitate their work, a headquarters staff of technical assistants is maintained at the office of the American Medical Association. The members of the Council are not paid for their services; they contribute their time and information freely. The salaries of the full time secretary and other members of the headquarters staff are paid from the general funds of the American Medical Association; there are no fees in connection with the consideration or acceptance of foods or food advertising.

All of the work of the Council is carried on through correspondence and by the issuance of weekly mimeographed reports to each Council member. For this purpose a stenographic staff is maintained at the headquarters of the American Medical Association. Annual meetings also are held in Chicago for discussions. Reports summarizing the discussion at such meetings are published in *The Journal of the American Medical Association.*

The purpose of the Council is to consider foods and food advertising in the light of established knowledge or of the best authoritative opinion concerning food and nutritional values, and according to rules adopted by the Council in the interest and for the protection of public health and public welfare. Foods that appear to conform to the requirements thus formulated are declared "accepted" by the Council.

Scope of the Council's Work

Not All Food Products Are Considered for Acceptance. It has not been possible for the Council to exercise supervision over foods of every kind; hence certain natural foods of well known nutritive value, such as milk, butter, eggs, fresh fruits and vegetables, are not accepted, although claims made in general advertising may be reviewed and granted the Seal of Acceptance. Processed foods have been the chief concern because it is largely through advertising that the consumer is informed as to the composition and nutritive properties of such foods. The Council aims to render service by recognizing the products of firms which honestly desire to restrict their claims to those which the Council believes are well established.

The Council also has decided to omit from the food products given consideration with a view to determining acceptability of individual brands, the following items: ordinary breads and similar well known bakery products, the nutritional features of which are generally recognized; sausage products; carbonated beverages and their syrup bases; dyes for coloring foods and Easter eggs; ice creams; sherbets and ices; spices, condiments and sauces; noniodized salt; candy and confectionery products for which no health claims are made; products sold to manufacturers for use primarily in the preparation of other food products; chemicals used in the preparation of food; tomato juice and orange drinks bottled and distributed by dairies. With the foregoing processed foods, as with the natural foods which are not given consideration, the Council will review nutritional claims made for the products and will report on them when it is considered in the interests of the public to do so. Should there be developed in the foregoing list of exempted foods any products which have nutritional value beyond that of ordinary products, or if special claims are advanced, the Council will consider such claims and report on them when such action is considered desirable.

General or Educational Advertising is Considered. Educational food advertising is the term often used to designate a type of informative advertising which deals with foods as a class, usually without reference to a specific brand. The material is often printed in the form of pamphlets, leaflets and brochures in handsome style, often intended for use in schools. Educational food advertising presenting scientific information on the nutritional or physiologic values of foods is considered by the Council. When such advertising is acceptable to the Council, it may display the Council's Seal of Acceptance.

Reports of the Council. From time to time the Council prepares reviews of recent developments in the field of food and nutrition. These reviews are published in *The Journal of the American Medical Association.*

Procedure in Consideration of Foods. It is often asked how the Council goes about consideration of food products. The manufacturer or distributor of a product on which acceptance is desired writes to the Secretary of the Council at 535 North Dearborn Street, Chicago, and is asked to read the material beginning on page 9, and is provided with a copy of the Official Rules and Regulations of the Council. These are described in detail on page 12. Briefly, the rules specify that the Council be provided the following information:

1. Name of product, name of both manufacturer and distributor and information relative to the extent of area of sales and advertising.
2. A complete list of ingredients and quantities thereof entering into the product.
3. Detailed information on the culture, harvesting collection, delivery, storage, freshness, selection, ripeness, quality, freedom from contamination and sanitation of the food itself. If the food is fabricated, specifications or definitions of all ingredients.
4. Precise and detailed description of all steps of manufacture from the initial stages of the raw materials to the final packing operation or shipment from the factory.
5. A report of a complete chemical analysis made by a reputable laboratory. This should include: data on moisture, ash or mineral matter, fat, protein, sugar, crude fiber and total carbohydrates (other than crude fiber), and sometimes other ingredients. This information provides a sound basis for judging the nutritional claims that can be made for the product. From the composition the calory or fuel value may be calculated.
6. Claims for sterility must be supported by reports of microscopic and bacteriologic examination by a competent laboratory or bacteriologist.
7. Claims for vitamins must be confirmed either by references to authoritative studies in scientific literature or by direct biologic or chemical tests with market samples of the food product by a competent laboratory or analyst.
8. Conformity of the food product to terms and provisions of the federal Food, Drug and Cosmetic Act or federal food regulations must be assured.

The market sample of the food product, which it is desired to have considered, is noted and its label and advertising carefully reviewed by each member of the Council. If the Council

members are assured that the food is wholesome and complies with requirements as to ingredients, composition or nutritional values prescribed by them or by the government under federal food statutes and if the label and advertising are considered truthful and proper for the food, acceptance is granted for two years. At the time of acceptance, the manufacturer or distributor of the food product must agree to maintain the food and all advertising subsequent to acceptance in complete accord with the rules and regulations of the Council. Firms are permitted to use new claims in their advertising provided such claims are first submitted to and accepted by the Council. At the end of each two years the product and its advertising are submitted to further review to determine whether acceptance can be extended.

A food product is not eligible for the list of accepted foods if the manufacturer or distributor is unwilling to disclose any facts regarding its preparation. The Council is of the opinion that the public deserves to know the ingredients of the food it purchases. There are no sound arguments justifying secrecy about the composition of foods.

A food product is not accepted if it does not comply with requirements of composition, standards and labels formulated by the United States Food and Drug Administration.

A food product is not accepted if its identification label is not properly informative or if the trade name is misleading or deceptive by implication. An acceptable food label has the common name of the food or a descriptive statement of the identity of its ingredients arranged in the order of their decreasing proportions by weight in the food and in easily legible type in proximity to the trade name on the label.

A food product is not accepted if the submitted advertising used in its promotion contains unwarranted nutritional or health claims, even though the composition, method of manufacture and labeling of the food product appear in other respects to conform to the requirements of the Council.

If a food and its advertising do not comply with the requirements of the Council, the manufacturer or distributor is notified and allowed a reasonable time to make recommended changes in the advertising or in the composition of the food. If the manufacturer is unwilling to make these changes, notice of nonacceptability is published in *The Journal of the American Medical Association.* When rejected foods or advertising comply with Council requirements they may become eligible for acceptance.

If the manufacturer is willing to make the advised changes the food product is accepted and notice of acceptance is published in *The Journal of the American Medical Association,* and in the book "Accepted Foods." All food products accepted by the Council are entitled to display the Seal of Acceptance

on the label and advertising. Thus the Council hopes to institute a system of self control by which the food industry will be governed within itself by established knowledge, for the welfare of the public and of the entire food trade.

Significance of Acceptance and Seal. The acceptance of a food or of general educational advertising independent of specific commrecial brands, and the Seal of Acceptance of the Council are intended to signify:

(a) That the food article, its label and all advertising in its promotion or the general educational advertising, whether the Seal be used or not, comply with the requirements of the Council as formulated in its Rules and Regulations and General Decisions.

(b) That the food article and the package label conform to the provisions of the federal Food, Drug and Cosmetic Act or federal food regulations.

(c) That the manufacturer, distributor or sponsor of the accepted food or accepted general educational advertising, has agreed to comply with the Rules and Regulations and General Decisions of the Council on Foods.

All food products accepted by the Council are entitled to display the Seal of Acceptance on the label and advertising. The Seal of Acceptance denotes that the food product and the nutritional claims made for it are acceptable to the Council on Foods. The Seal is not a recommendation, neither is it a certificate or guarantee of purity. The Seal does mean that the product on which it appears is produced by a manufacturer who has supplied all the information demanded by the Council. The Seal is, in a sense, a token which means that the advertising is in harmony with the Rules, Regulations and General Decisions of the Council on Foods.

The appearance of the seal on fabricated foods does not indicate that such products are to be preferred over nutritionally desirable products in their natural state. All foods which stand accepted are considered by the Council to be wholesome but not necessarily to be preferred to simple natural foods.

Certain Policies of the Council Regarding Fabricated Foods

Foods Fortified with Minerals or Vitamins or Both. As a result of recent developments in the field of nutrition, there have been not only improvements in the processing of foods, with a view to conserving vitamins and minerals of each product, but also an effort to improve foods by fortifying them with vitamins or minerals or both. The Council on Foods recognizes that the fortification of foods, if rightly done, may make it easier for persons to select an adequate diet than is otherwise the case. As a result of its study of available evidence, the

Council[1] adopted the following statement as an expression of present policy:

The Council on Foods desires to encourage the restorative addition of vitamins or minerals or other dietary essentials, in such amounts as will raise the content of vitamin or mineral or other dietary essential of general purpose foods to recognized high natural levels; with the provision that such additions are to be limited to vitamins or minerals or other dietary essentials, for which a wider distribution is considered by the Council to be in the interest of the public health.

The Council is opposed to the indiscriminate fortification of general purpose foods with vitamins or minerals or other dietary essentials. By fortification is meant the addition to a food of such an amount of a vitamin or other dietary essential as to make the total content larger than that contained in any natural (unprocessed) food of its class.

The following fortifications are recognized by the Council as being in the interest of the public health: (1) the addition of vitamin D to milk to an extent not to exceed 400 U. S. P. units per quart, no objection being made when the added vitamin is obtained from a natural source, if it carries with it one or more other vitamins; (2) the addition of vitamin A to substitutes for butter to an extent not to exceed the amount of vitamin A in butter of high natural content of vitamin A, no objecion being made when the added vitamin is obtained from a natural source, if it carries with it one or more other vitamins; (3) the addition of iodine to table salt in an amount not to exceed one part of sodium or potassium iodide for each 5,000 parts of salt; (4) the addition of calcium salts to wheat flour or other cereal product in an amount such that the calcium content of the finished product does not exceed 0.075 Gm. for each 100 calories, and (5) the addition of iron to wheat flour or other cereal product in an amount such that the iron content of the finished product does not exceed 0.0015 Gm. (1.5 mg.) for each 100 calories.

For the purpose of this decision the Council will consider that a food is "fortified" if it is enhanced as to vitamin content or potency by the addition of vitamin concentrates, or of natural products of extraordinary vitamin potency, or by other means accomplishing the same results.

Vitamins and Vitamin Units

A summary[2] of the available knowledge concerning certain phases of vitamin study representing the views of a considerable number of authorities has recently been published. Therefore the discussion that follows is limited to explanation of terms and units used in this book.

1. Annual Meeting of the Council on Foods, J. A. M. A. 113:680 (Aug. 19) 1939.

2. The Vitamins; A Symposium, Chicago, American Medical Association, 1939.

Vitamin A. The term vitamin A is applied to any one of several substances or to a mixture of them producing a certain demonstrable specific physiologic effect. The vitamin A content of a product is expressed in terms of U. S. P. units or international units. One U. S. P. unit is equal to one international unit.

Conversion Factors for Changing Sherman Units of Vitamin A into International Units, and Problems Relating Thereto. Data regarding the vitamin A content of food products have also been reported in terms of Sherman units. These units depend on the growth response of experimental animals, which is subject to variation in different laboratories and at different times in the same laboratory. The Sherman unit therefore has no fixed value. It is now generally considered that the estimation of vitamin A in terms of international (or U. S. P. units) provides a means of compensating for a number of the variables inherent in the older method. According to the international system, the unit amount of vitamin A is defined as that which is contained in a definite amount of standard substance. The vitamin A content of a food product is determined by comparing the growth response of animals receiving a substance tested with the growth response of animals simultaneously fed the standard reference material. Thus, variations in growth due to unsuspected variations in composition of diets and other factors cancel out and the international unit becomes a relatively fixed value.

In 1933 the U. S. P. Vitamin Advisory Board reported that, on the basis of evidence then available, 1 Sherman unit appeared to be equal to about 1.4 international units. This was not an official factor but was widely adopted at that time for the conversion of Sherman to international units both in the drug and food fields. From evidence which has later accumulated in various laboratories, it now appears that 1 Sherman unit may be equal to from 1.4 international units to 0.5 international unit. A factor for the conversion of one unit into another is not necessary at the present time for pharmaceutical products, because there are relatively few of these and the potency can be determined by the U. S. P. method. In calculations for nutritional purposes, however, it will be necessary for some time to come to convert one unit into another. It is not possible, and because of the nature of the problem it will not be possible, to select a single factor which is entirely satisfactory. It is the consensus of the Council,[3] after reviewing available data, that the most probable relationship is 1 Sherman unit equals from about 0.66 to 0.80 international unit.

In cases where a firm has reported the vitamin A content of their accepted product in terms of Sherman units, the Sherman

---

3. Conversion Factors for Changing Sherman Units of Vitamin A into International Units, and Problems Relating Thereto, Annual Meeting of the Council on Foods 111: 157 (July 9) 1938.

unitage has been converted to the international units by using the factor 0.75, for purposes of rough approximation.

Vitamin B Complex. The term vitamin B complex is applied to a group of substances which have been shown to be constituents of what was formerly called vitamin B. The exact number of these constituents is not known at present, but the following have been mentioned in a recent discussion[4] of the subject: Vitamin B_1, riboflavin, nicotinic acid or nicotinic acid amide (the pellagra-preventive factor), filtrate factor or antidermatitis factor, vitamin B_3, vitamin B_4, vitamin B_5, vitamin B_6, and factor W.

The vitamin B complex content of a product of course is no longer expressed in units of vitamin B complex per se, but in units of its various components. Of these components vitamin B_1, riboflavin and nicotinic acid are best known.

Vitamin B_1. The term vitamin B_1 is applied to that fraction of the vitamin B complex that is of fundamental importance in connection with the disease beriberi. Vitamin B_1 is also known as thiamin and the pure hydrochloride of the vitamin is known as thiamin chloride (the U. S. P. term is "thiamin hydrochloride").

The vitamin B_1 content of a substance may be expressed in terms of international units, or U. S. P. units or in micrograms of thiamin chloride. The international unit and U. S. P. unit are identical and each is equivalent to 3 micrograms of thiamin chloride.[5]

In this book the vitamin B_1 content of a food is expressed usually in international units and in micrograms.

Vitamin C. Vitamin C is also known as ascorbic acid and as cevitamic acid. The vitamin C content of a product is expressed in terms of international units or in terms of milligrams of ascorbic acid. One international unit is equal to 0.05 mg. of ascorbic acid.

Vitamin D. The term vitamin D is applied to one or more substances which function in the proper utilization of calcium and phosphorus. The vitamin D content of products listed in this book is expressed in terms of U. S. P. (United States Pharmacopeia XI, 1936) units. One U. S. P. unit is equal to one international unit.

Vitamin G. The term vitamin G as used in this book refers to the riboflavin component of the vitamin B complex. The vitamin G content of a food product is expressed in Sherman-Bourquin units.[6] There is evidence that one Sherman-Bourquin unit of vitamin G is equal to about 3 micrograms of riboflavin, under the conditions of assay originally described.

---

4. Nelson, E. M.: The Components of the Vitamin B Complex, J. A. M. A. **110**: 645 (Feb. 26) 1938; in The Vitamins: A Symposium, Chicago, American Medical Association, 1939, chap. 6, p. 127.

5. Reference Standard and Assay for Thiamin Chloride or Vitamin B_1, J. Am. Pharmaceutical Assn., **28**: 267 (May) 1939.

6. Bourquin, A., and Sherman, H. C.: Quantitative Determination of Vitamin G (B_2), J. Am. Chem. Soc. **53**: 3501 (Sept.) 1931.

Factors Used for Converting Percentage Nitrogen in Foods into Percentage Protein

In analyzing a food product it is common practice to determine total nitrogen and then to multiply this value by a factor to obtain the percentage of protein. The factors for converting percentage nitrogen in foods into percentage protein as given by Jones [7] are provided in table 1 and have been used throughout this publication.

TABLE 1.—*Factors for Converting Total Nitrogen to Protein*

Food	Factor
Almonds	N × 5.18
Eggs	N × 6.25
Cereals	
Barley	N × 5.83
Corn	N × 6.25
Oats	N × 5.83
Rice	N × 5.95
Rye	N × 5.83
Wheat, bran	N × 6.31
Wheat, embryo	N × 5.80
Wheat, endosperm	N × 5.70
Wheat, whole kernel	N × 5.83
Gelatin	N × 5.55
Meat	N × 6.25
Milk	N × 6.38
Mixed foods	N × 6.25
Soybean	N × 5.71
Other foods	N × 6.25

Detailed Information for Manufacturer

Submission of Foods

Form of Submission. Any food which it is desired to have considered for *acceptance* should be submitted to the Secretary of the Council on Foods of the American Medical Association, 535 North Dearborn Street, Chicago, Illinois, U. S. A. Except in special instances the submission should be accompanied by 15 packages of the article with labels, 15 separate labels of each size and type used and 15 sets of all advertising, including booklets, leaflets, magazine and newspaper advertising, and copies of statements on billboard displays, in radio copy, etc. Should advertisement material be too bulky for convenient mailing, photostatic copies of such advertisements will suffice.

In addition the submission should include the subjoined requisite information, preferably in itemized form and in the order given. It is readily understandable that the information called for is necessary for the thorough and comprehensive considera-

7. Jones, D. B.: Factors for Converting Percentage of Nitrogen in Foods and Feeds into Percentages of Proteins, Circular 183, United States Department of Agriculture, Aug 1931.

tion of the Council to enable it to arrive at correct conclusions and to make proper decisions. The information desired should therefore be submitted with due accuracy, care and completeness and without ambiguity. The Council will be pleased to give specific advice in cases of uncertainty as to the kind of information wanted.

Information to be Submitted:

Name of product.

Name of manufacturer or distributor.

Information relative to the extent of area of sales and advertising.

Ingredients. Complete list of ingredients and quantities thereof entering into the product in the case of food mixtures or compounds.

Raw materials used. When detailed information on the culture, harvesting, collection, delivery, storage, freshness, selection, ripeness, quality, sanitation, specifications, etc., of a food article is essential to the proper understanding or interpretation of promotion claims or of the quality, nutrient value, wholesomeness, soundness or other values of the food itself, this should be provided. Specification or definition of all ingredients used in the preparation of fabricated foods should be furnished. Failure to furnish this information in adequate detail will be sufficient cause to withhold products from consideration by the Council until such time as it is received.

Process of Manufacture. Description of all steps of manufacture from the initial stages of the raw materials to the final packing operation or shipment from the factory should be furnished with due care and precision. This should include washing, cleaning, peeling, pitting, trimming, cutting, blanching, mixing or other preparation or treatment of the raw materials; and detailed description of all processing, operations or procedures such as pasteurization, sterilization, drying, toasting, baking, cooking, concentration, canning, packing, etc. Information on manufacture is of prime importance to the Council. Products for which this information is not deemed complete or wholly satisfactory for the purpose of the consideration of the Council will not be accepted.

Analysis. Percentage proximate chemical analysis to include in general: moisture, ash or mineral matter, fat (ether extract), protein (N $\times$ factor), sucrose, reducing sugars as dextrose or invert sugar, crude fiber, total carbohydrates other than crude fiber (by difference), etc. The methods of the Association of Official Agricultural Chemists shall be used when applicable. Other recognized, accurate methods will be acceptable when the methods of that association are not used for some definite reason. References to literature should be given for all methods other than those of the above mentioned association. In cases of claims for specific salts or elements, the

report of analysis should include such additional analytic data. Analytic results for chemical elements should be expressed on the basis of the elements and not of the oxides. The analysis submitted in all cases should be that of the product as marketed. The name of the chemist responsible for the analysis should be signed on the report.

Calories Per Gram or Ounce. This value is computed from the chemical analysis. The conversion factors used for protein, fat and carbohydrate are respectively 4, 9 and 4 calories per gram. Calories per gram are multiplied by the factor 28.4 or by the factor 29.6 to obtain calories per averdupois ounce or per fluidounce, respectively.

Microscopic Organisms. Claims of sterility, of maximum number of bacteria or molds, absence of pathogenic or presence of specific organisms, should be supported by results of microscopic and bacteriologic examination. Recognized standard methods should be used wherever possible, and the methods used described briefly in the report, or references should be provided to articles which describe the methods. The name of the bacteriologist responsible for the investigation should be signed on the report.

Vitamins. Specific vitamin claims must be based on satisfactory evidence, preferably by direct biologic tests of market samples by a competent investigator. Report of assays should be complete enough to enable appraisal of the work and the deductions therefrom. In the case of vitamin C, chemical titration may be sufficient evidence of the ascorbic acid potency of products for which it has been demonstrated that the chemical method is sufficiently precise. It is important that assay of the vitamin potency of food products be performed on samples which have been kept under conditions of storage comparable to those to which the food product is likely to be subjected. The requirements for special purpose foods are further mentioned on page 295.

Conformity to terms and provisions of the Federal Food, Drug and Cosmetic Act or Federal Food Regulations. The Council must have assurance that the food article is not in violation of laws and regulations pertaining to adulteration and misbranding of food products. It is understood that the Council may discuss with the federal Food and Drug Administration any apparent violations by misbranding or adulteration.

Rules

The Council on Foods has adopted certain rules pertaining to accepted products; in general these rules are similar to those followed by the Council on Pharmacy and Chemistry. The rules of the Council on Foods are as follows:

Rule 1.—Any food product submitted which comes within the scope of the Council is either declared accepted or, when the firm does not meet the Council's

requirements, declared not acceptable. Notice of acceptance or nonacceptability is published in *The Journal of the American Medical Association.* The Council also may authorize publication of reports on food products even when they have not been submitted, if it is considered to be in the interest of the public.

Rule 2.—The name and composition of a product must not conflict with the regulations of the U. S. Food and Drug Administration. If a fanciful or brand name is used for a product, it must not be misleading, and a descriptive statement of all ingredients, indicated by the common name of each, must appear prominently on the main panel of the label, arranged in the order of their decreasing proportions.

Rule 3.—Labels of the food product must conform to the regulations of the U. S. Food and Drug Administration.

Rule 4.—Advertising must not contain claims that are unacceptable to the Council. Advertising is considered to include all material issued by the firm to promote sale of its products. It includes direct mailings to consumers and physicians, radio continuity and films as well as all other ordinary advertising. The Council on Foods is in complete agreement with the following expression of the Council of Pharmacy and Chemistry: "In passing on advertising material, the Council endeavors to indicate the type of claims which are acceptable and the nature of objectionable statements. It is not a function of the Council to edit advertising copy word for word and sentence for sentence, but rather to indicate the general type of revision required in any given piece of advertising copy. The Council holds the firm responsible for compliance with the specifications of the Council's objections and expects the spirit and intent of such objections to be observed in the remainder of the copy not specifically criticized. Advertising copy which has been accepted by the Council may be used in whole or in part in later advertising, provided that this does not exceed the scope, content and purpose of the original material, and provided that there have not been any developments which would invalidate the originial material."

Rule 5.—No new claims shall be made in advertising until the claims have been submitted to the Council and declared acceptable.

Rule 6.—The Council must be advised of any changes in composition of the product, in process of manufacture or of any other nature, made subsequent to announcement of acceptance.

Rule 7.—No food product or class of food products, or advertising therefor, will be accepted, or if accepted will be retained, if in the opinion of the Council such acceptance is likely to be construed as an acceptance or approval of any other products or activities of a firm, when such other products or activities of such firm are in conflict with the policies of the American Medical Association as set forth in the rules of the Council on Foods or those of the Council on Pharmacy and Chemistry or of the Council on Physical Therapy.

Rule 8.—The Seal may be used on the container label or in connection with any form of advertising effort or display related to the product, after official notification of *acceptance* by the Secretary of the Council. In all cases the Seal shall appear only on label or advertising pieces which prominently identify the accepted article and the responsible manufacturer or distributor.

The Seal displayed on a label or advertisement featuring in any manner both *accepted* and *unaccepted* foods must be used or associated with the *accepted* products only in such manner that there can be no implication that the Seal applies to the *unaccepted* foods also. Neither the Seal nor any statement regarding *acceptance* may be used if there is any possibility of confusion or incorrect inferences.

Statements Accompanying Seal: The Seal shall appear without comment on its significance unless such comment has been previously approved by the Council. A statement proposed for such use follows:

The Seal of Acceptance denotes that [product name] and nutritional claims made for it are acceptable to the Council on Foods of the American Medical Association.

The Council will not, however, object to any statement which is wholly in accord with its own definition of the significance of the Seal provided such statement is approved by the Council before use. The Council will not approve any statement regarding the significance of the Seal which, in its opinion, implies (a) that the American Medical Association rather than the Council on Foods has accepted the product; (b) that the Council is responsible for standards of purity or wholesomeness of foods; (c) that the Seal is a certificate or guarantee of purity, or (d) that the Seal denotes approval rather than acceptance of a product. The use of the phrase "recommended for" on labels or in advertising bearing the Seal of Acceptance cannot be permitted because it conveys the impression that the Council recommends a particular food, which is not true. Satisfactory substitutes for this phrase are "suitable for" or

"useful for" or "adapted to." The Council strives to maintain standards of purity and integrity for foods, such standards being fixed by government and other agencies officially charged with such duties, and on its own initiative the Council establishes high standards for truthful food advertising.

Size of Seal: The Seal in advertising matter or display apart from container label shall be proportioned to the dimensions of the advertisement so as to afford ready recognition and legibility under the conditions of use or display. The Seal on the usual size of package shall be not greater than one inch in height or diameter; a two inch Seal is permissible on very large containers as, for example, 48 pound flour sacks. Undue size giving greater prominence to the Seal than to other important features of the advertisement, or detracting from the dignity of the Seal in the opinion of the Council, will not be permitted.

Whenever the foregoing rules are broken by the manufacturer or distributor, the Council may by vote revoke the privilege of displaying the Seal and publish an announcement in *The Journal of the American Medical Association* to that effect.

General Problems Relating to Food Advertising

Food advertising must be considered from the points of view of both the public and the food merchandiser. Truthful advertising effectively serves the interests of both. Facts should be so stated as to avoid misinterpretation or misunderstanding. Appropriate explanations or pertinent information should accompany scientific statements whenever necessary to assure their correct interpretation. A primary duty of sponsors and writers of educational advertising should be to make certain that all statments not only are truthful, but will be thoroughly and properly understood.

Educational advertising should properly evaluate foods with respect to those common on the market and to the requirements of an adequate diet. Exaggeration or implication that all the nutritive values reside in a single food or any undue emphasis on the nutritional or physiologic values of any one food is a form of deception.

It is proper to advertise foods in such a way as to show their content of nutritional essentials. It is proper also to indicate any unique physiologic property if such can be proved by adequate evidence. Foods vary in their nutritional contributions to a complete diet and must be intelligently selected to provide a balanced dietary or correct an inappropriate regimen. Foods which will supply some nutrient essential or property not easily secured from common foods have especial value because of the substance or property they supply and not because of any inherent mysterious health values.

Rating Individual Food Products as Sources of Dietary Essentials. When one is rating a food product as a source of a given dietary essential, cognizance must be taken of the following items:

1. The estimated daily requirement for the given nutritional factor.
2. The proportion of this estimated daily requirement which the food supplies in an average portion, or in an amount that may be consumed in a day.
3. The frequency of the appearance of the food product in the ordinary diet.
4. The availability, from the standpoint of cost and accessibility, of a food rich in the given dietary essential; for example, milk is a rich source of calcium, is inexpensive, and is readily available in some form the year round.
5. The distribution of the given dietary essential in common food products.
6. The dietary purpose of the food product in question. Is it intended to form a part of the regular dietary or is it intended as a food for special dietetic purposes? Infant foods must be considered apart from those of adults because of the limited number of foods which may be included in the infant's diet and the relatively small amounts of each of these, except milk, which may be consumed; and because the requirements of children are quantitatively considerably different from those of adults.

Other factors which need be taken into account are the biologic value and physiologic availability of the dietary essentials in the food product: For example, proteins vary in their content of essential amino acids and therefore in their ability to serve as a source of tissue-building material. In general, most plant proteins are of lower biologic value than those of milk, eggs, meat, or fish, but when combined with appropriate amounts of protein from animal sources they may form a mixture of high nutritional value.

Not all of the calcium, phosphorus or iron of foods may be physiologically available. For example, the calcium of spinach has been shown [8] to be almost completely unavailable to the organism, owing to the presence of insoluble calcium oxalate. On the other hand, the calcium of kale, collards and turnip greens, which contain no oxalic acid, is about as well utilized as that of milk.[9] Some of the phosphorus of grains is in an unavailable form known as phytin. As regards the iron content of foods, it

8. The Nutritional Value of Spinach. A Report of the Council on Foods, J. A. M. A. **109**: 1907 (Dec. 4) 1937.
9. Spiers, Mary: The Utilization of Calcium in Various Greens, J. Nutrition **17**: 557 (June 10) 1939.

has been suggested[10] that ionizable iron, as determined by the dipyridyl method, is physiologically more available to the organism than are other forms of this mineral. This has not been satisfactorily demonstrated as yet and the question cannot be regarded as settled at present.

Standards for Rating Foods as Sources of Minerals and Vitamins in the Customary Diet of Healthy Adults.—In the final analysis, the rating of foods depends not only on the chemical composition of the food product, as is indicated by its analysis, but also on the biologic value of the food as determined by biologic assay. To equate these two factors is a matter of judgment.

The Council considers that a food can usually be rated as a source of a given dietary essential in the customary diet of adults, according to the following procedure, remembering that other knowledge may change the rating after the calculations have been made:

1. In general, when one-tenth of the day's requirement is furnished by a food which appears in the diet practically every day, and in which the portion contributing one-tenth of the essential furnishes not more than 100 calories, the food may be classed as an "excellent" source.
2. When one-tenth of the day's requirement is contributed by an amount of the food which at the same time furnishes not more than 200 calories, the food may be classed as a "good" source.
3. When one-tenth of the day's requirement for an average man is furnished in a portion which can be easily eaten in one day, the food may be regarded as a "fair" source.
4. When a food is not one which can be easily eaten in amounts to furnish one-tenth of the day's requirement or is one eaten infrequently, or both, and the amount required for one-tenth of the day's allowance of the essential furnishes more than 200 calories, the food is a "negligible" or "poor source."

For the purposes of this decision the daily requirements of normal adults for the various dietary essentials are considered to be as follows: protein 1 Gm. for each kilogram of body weight, or about 70-75 Gm. for a man of average weight (70 kilograms, equivalent to 154 pounds); calcium 0.68 Gm.; phosphorus 1.32 Gm.; iron 15 mg.; vitamin A 4,000 U. S. P. or international units; thiamin 400 international units; ascorbic acid 1,000 international units; riboflavin (vitamin G) 600 Sherman-Bourquin units. Available evidence indicates that these amounts exceed minimum requirements and provide a reasonable margin of

10. Elvehjem, C. A.; Hart, E. B., and Sherman, W. C.: The Availability of Iron from Different Sources for Hemoglobin Formation, J. Biol. Chem. 103:61, 1933. McCance, R. A.: Ionizable and Available Iron in Foods, Chem. and Ind. 58:528, 1939.

safety for the average normal adult. There is as yet no agreement among investigators as to the probable daily iodine requirement. Neither are adult requirements for nicotinic acid known with sufficient numerical accuracy to warrant an attempt to rate foods as sources of this substance. Adult requirements for vitamin D, if indeed a need for a dietary source of this factor exists, are also undetermined.

To illustrate how these principles work in practice, the amount which may be eaten in a day and approximate composition of a few common foods are presented in table 2. From these data and judged by the standards just outlined, the foods are rated as follows:

> Milk is rated as an excellent source of calcium, phosphorus, vitamin A and riboflavin (vitamin G) and a negligible or poor source of vitamin B_1 and iron. Strict interpretation of the principles outlined above would permit rating milk as only a good source of protein, but owing to the high biologic value of its protein and the relatively small quantity of milk required to furnish significant amounts of protein, milk can and shou'd be considered an excellent source.
>
> Lean beef is rated as an excellent source of protein, phosphorus, and vitamin G (riboflavin), a fair to poor source of vitamin B_1[10a] and a negligible source of vitamin A and calcium. Although there is evidence that the iron of meat may be only about 25 to 50 per cent available, lean beef still merits rating as a good to excellent source of iron because of its high total iron content.
>
> Potato is rated as a good source of iron and an excellent source of vitamin C. This vegetable also warrants rating as a good source of vitamin B_1 because two 100 calory portions of potatoes easily may be eaten daily.
>
> Commercial white bread is rated a fair source of calcium, iron and vitamin B_1. Although the total quantity of protein would apparently permit rating as a good source of protein, the quality is such that white bread even when made with customary amounts of milk (a maximum of 4 per cent milk solids on the basis of the finished loaf) can be rated only as a fair source of protein.
>
> Farina is rated as a poor source of protein, minerals and vitamins because it contains insignificant amounts of these essentials.
>
> Tomato juice is rated an excellent source of vitamin A and ascorbic acid and a good source of vitamin B_1 and riboflavin (vitamin G).

10a. This rating is based on data in Rose, M. S.: Laboratory Handbook for Dietetics, ed. 4, New York, The Macmillan Company, 1937. A discussion of the newer work is provided in section VII, Meats, Fish and Sea Foods. p. 213.

TABLE 2.—*Approximate Composition of Specified Amounts of Selected Foods* *

Food	Approximate Serving	Weight of Serving, Gm.	Calories	Protein, Gm.	Calcium, Gm.	Phosphorus, Gm.	Iron, Mg.	Vitamin A, International Units	Vitamin B_1, International Units	Vitamin C, International Units	Vitamin G, Sherman-Bourquin Units
Milk (pasteurized).....	1 pint	488	320	16	0.53	0.42	0.98†	1,325	25	...	145
Meat (lean beef round)	....	125	200	27	0.02	0.26	3.8	125	30	...	125
Potato (cooked and mashed).............	½ cup	120	100	2.5	0.01	0.05	1.1	50	25	250-300‡	30
White bread...........	6 ½-inch slices	120	336	11.0	0.09§	0.10	1.2	..	36‖	...	..
Farina, light (cooked)	Medium	170	103	3.1	0.006	0.035	0.23	..	0.5	...	...
Tomato juice..........	⅞ cup	200	48	2.0	0.012	0.030	0.012	1,700	30	800	40

* Computations in this table, unless otherwise indicated, are based on Rose, M. S.: Laboratory Handbook for Dietetics, ed. 4, New York, The MacMillan Company, 1937.

† Sherman, H. C.: Chemistry of Food and Nutrition, ed. 5, New York, The MacMillan Company, 1937.

‡ Richardson, E.: Davis, R., and Mayfield, H.: Vitamin C Content of Potatoes Prepared for Table Use by Various Methods of Cooking, Food Research **2**: 85, 1937.

§ Prouty, W. W., and Cathcart, W. H.: The Calcium Content of White Bread, J. Nutrition **18**: 217 (Sept.) 1939.

‖ Morgan, A. F., and Frederick, H.: Vitamin B (B_1) in Bread as Affected by Baking, Cereal Chem. **12**: 390 (July) 1935.

Accepted foods whose composition justifies rating as good or excellent sources of a given dietary essential may be properly advertised as such. For foods rated as a fair source the claim "contains . . . (the dietary essential)" will be accepted on labels and in advertising for the product. Negligible or poor sources do not warrant recognition either on the labels or in advertising.

Foods Used in Infant Feeding.—The dietary requirements of infants and young children cannot be stated with the numerical accuracy possible for adults. It is generally recognized, however, that the young baby who is receiving breast or suitably modified cow's milk and cod liver oil or equivalent vitamin D supplement in customary and appropriate quantities has his needs for calcium, phosphorus, vitamins A and D and riboflavin (vitamin G) satisfied. Therefore the amounts of these dietary essentials which might be supplied by the customary supplements to the basal milk diet can hardly be considered significant for the average normal infant. It is difficult, if not impossible, to formulate a satisfactory general rule for the rating of these supplements as sources of other dietary essentials. Each constituent must be considered separately. The needs of infants 6 months of age may be taken as representative for this purpose.

Iron.—Adopting 0.5 mg. per Kg. of body weight as a conservative allowance for iron during the first year of life,[11] a 6 months old infant would need a total of 4 to 5 mg. daily. Customary amounts of milk (about 24 ounces at 6 months of age) will furnish about 1.4 mg., or less. A supplementary food which merits rating as an excellent source of iron should supply not less than 1.0 mg. a day in a portion suited to the age of the infant. A supplement which furnishes 0.5 mg. may be considered a good source. Less than 0.5 mg. is not considered significant. The portions in which these amounts of iron occur should furnish not more than 100 calories.

Thiamin (Vitamin B_1).—Available evidence indicates that a satisfactory standard for the thiamin intake of children is in the neighborhood of 10 to 15 international units per 100 calories. Infants may require about 100 international units of thiamin daily.[12] Milk may be expected to furnish from 25 to 50 units and the supplements must make up the remainder. On this basis a food yielding from 30 to 50 international units in a portion suited to the age of the infant may be considered an excellent source; one yielding 15 to 30 units may be rated as a good source. Because of the relatively high requirement and the limited amounts available in the customary supplements, a

11. Jeans, P. C.: Specific Factors in Nutrition, J. Pediat. 9:693 (Nov.) 1936.

12. Consideration of the Available Knowledge Regarding Certain Specific Problems of the Science of Nutrition, Report by the Technical Commission on Nutrition on the Work of Its Third Session, League of Nations, Qr. Bull. Health Organ 7:470 (June) 1938.

food which yields 10 to 15 international units of vitamin B_1 in a portion of appropriate size may be rated as a fair source for infants.

Ascorbic Acid (Vitamin C).—Inasmuch as pasteurization destroys the greater part of the original ascorbic acid content of cow's milk, the main source of vitamin C for the artificially fed baby is in the supplements to milk. Considering 300 international units as a suitable allowance,[12] only a food which will furnish 150 to 200 international units in a portion suitable to the age of the infant warrants rating as excellent. A food which will furnish from 100 to 150 units may be rated as good, and one furnishing 75 to 100 units, fair.

Foods (Other Than Infant Foods) Intended for Special Dietary Use.—Certain preparations which may be classed as foods, are not usually included in the customary diet but are recognized as outstandingly rich sources of one or more of the dietary essentials. Such products may be wheat germ, yeast or the dried and powdered leaves of young cereal grasses, or fabricated foods fortified either by the addition of substances rich in minerals or vitamins or both or by the addition of the minerals or vitamins. These products, which are more fully described in section IX, "Foods for Special Dietetic Purposes," are frequently employed for the purpose of compensating for an existing vitamin or mineral deficiency or raising the vitamin or mineral content, or both, of therapeutic and other diets to a point considerably above average normal levels.

It is obvious that amounts of a given dietary essential which might be considered significant for the purpose of meeting normal daily requirements could not be considered significant for such special dietary use. The Council has therefore adopted the following standards for the vitamin and mineral content of special purpose foods which warrant special recognition in advertising:

The claim that a food is valuable for increasing the vitamin or mineral content, or both, of therapeutic diets will be accepted only if the food provides, in the quantity consumed daily, not less than the following amounts of the dietary essential in question: calcium 0.45 Gm.; phosphorus 0.9 Gm.; iron (as Fe) 3 mg.; vitamin A 2,500 international units; vitamin B_1 (thiamin) 200 international units; vitamin C (ascorbic acid) 250 international units; vitamin D 135 international units. Sufficient evidence is not yet available to warrant the recognition of advertising claims for foods as sources of riboflavin, nicotinic acid or vitamin B_6 in prophylactic or other special diets.

For products which do not meet the foregoing standards for the rating of special purpose foods, but which do contain sufficient of a given dietary essential to warrant rating as a good or excellent source for ordinary dietary purposes the claim "contains (this dietary essential)" will be recognized. Wheat germ,

for example, contains a relatively high proportion of iron when compared with other foods, and may merit rating as a good source of this essential for the normal adult diet. However, the amounts of iron contained in the portions of wheat germ ordinarily consumed daily (½ to 1 ounce, or about 15 to 30 Gm.) are of little importance therapeutically. On the contrary, wheat germ is outstanding among natural products as a source of thiamin and is rich enough in this substance to be suitable for therapeutic use. Therefore, although iron may be present in nutritionally significant quantities, too great emphasis in advertising on this constituent would conceivably lead to misunderstanding. For this reason claims for the iron content of accepted brands of wheat germ must be restricted to the statement that the product "contains iron." No objection will be taken to simple statements of composition on the label or in advertising, but these statements must be worded so as to indicate clearly the amount of any given dietary essential which may be furnished by the quantity of food consumed daily.

Examples of Vague and Inaccurate Claims

Instances of objectionable claims in advertising have frequently been encountered by the Council. The following paragraphs provide brief discussion of the opinion of the Council as regards some of the more frequently encountered types of objectionable claims.

"Clinical Experience."—Vague claims for foods such as "clinical experience with *XYZ* has demonstrated its efficiency" are not informative either to the public or to the physicians and because of misleading therapeutic implications are objectionable. Such claims should state what clinical experience with the foods has demonstrated; they should be supported by actual experience of physicians. Claims regarding clinical experience are justified only if specific and supported by sufficient evidence. Vague claims in general are not instructive and lead to deceptive advertising.

Claims of clinical experience cannot be based on replies to general questionnaires promiscuously distributed to physicians. Information and data so obtained cannot be rated as the results of clinical experience.

"Questionnaire Evidence."—Questionnaires addressed to physicians, to members of other professional groups, or to nonprofessional individuals by food manufacturers or their agents, in most instances, do not elicit information of scientific consequence or significance. Questionnaires are of scientific value only when motivated by a sincere desire for truth or unbiased expert opinion rather than by self-centered interests or personal gain and when the persons participating are carefully selected and represent those who are scientifically and otherwise qualified to express an unbiased thoroughly scientific opinion in keeping with established

knowledge. In all cases, replies to questionnaires will be perfunctory and of little significance unless the replies are from persons whose critique and judgment are entitled to respect.

The use of questionnaires for obtaining information and data from the medical profession or the public for advertising purposes is to be discouraged. Such information and data are given undue and unwarranted importance and significance by the public, are misunderstood as to their real value and worth, and therefore are misinformative and misleading.

"Recommendations." — Vague claims of recommendation, approval or use by physicians, health or medical authorities, nurses, dietitians, hospitals and sanatoriums for specific foods and statements of similar import in food advertising are misinformative and convey misleading implications of unique nutritional or therapeutic values, or indicate that these persons or institutions as bodies have specially investigated and passed scientific or professional judgment upon the particular products, which is not true to fact. Proper and correct explicit statements of special uses for or values of individual foods, or statements based on special studies by recognized authorities are permissible.

"Testimonials."—Testimonials of a "health," medicinal or therapeutic character, or with such implication, in food advertising by persons unqualified to express a scientific authoritative opinion or judgment on the subject of the testimonial are misleading or deceptive and are not permissible. Testimonials accompanied by the writer's name and used with his permission will be considered as to their acceptability in individual instances.

"Treatment of Disease," "Nutrition of the Sick," "Recommending a Special Type of Diet." — Advertising giving detailed instruction to the public as to methods of treatment of disease, obesity or other abnormal states is unwise and undesirable. This practice promotes self diagnosis and self treatment, for which the layman is not qualified by training or experience, and thereby may endanger health or life. Special purpose diets should not be recommended to the general public. Even reducing without the advice of a physician is unwise and may be dangerous. Advertising dealing with treatment of disease or the nutrition of the sick, or recommending any special type of diet should be directed exclusively to physicians and, when not a part of medical publications, should conspicuously bear the phrase "For physicians only" or its equivalent.

"Trick Advertising."—Claims in food advertising implying for the food advertised the merits of something more valuable (such as milk) with which it may be admixed for use are of the nature of trick advertising. These claims are so constructed grammatically as to connect the stated values with the advertised food, whereas such values in large part are provided by the other products of the mixture. This trick grammatical structure is illustrated by the statement: "*XYZ* made with hot milk is not only delicious but nourishing. It is rich in the proteins,

fats, carbohydrates and minerals children should have." The antecedent of "it" is *XYZ;* the grammatical structure incorrectly makes *XYZ* the source of the fats, carbohydrates, minerals and proteins children should have. Claims of this character to all appearances are planned to trick the reader. Such a statement as "the mixture of *XYZ* and milk is rich in proteins, fats, carbohydrates and minerals (calcium and phosphorus)" is correctly informative and satisfactory but should be used in such a manner as to be free from false connotations.

Food advertising should be truthful in statement and by implication. Trick advertising and all other misleading forms are harmful to food advertising and merchandising generally.

"Energy."—All foods except the simple mineral foods and water contain chemical energy available for use by the healthy body to support the many activities and life processes and incidentally to maintain temperature. This use of the term "energy" in defining the caloric or energy value of foods should not be confused with the popular usage signifying activity, vitality, strength, vigor or endurance. These conditions depend on many factors, including freedom from disease, natural constitution, physical environment, training, habits and others. Good nutritive condition, a necessity for health, requires far more than food energy only; all the nutritional essentials of a complete, well balanced diet, in adequate amounts, are demanded.

Food advertising should correctly inform the public of the energy values of foods in carefully chosen terms that may be properly interpreted. The distinction between the caloric and popular senses of the word "energy" must be recognized and observed.

The advertisers of food products should also take cognizance of the fact that limitation of the energy intake is essential for reduction of body weight. There are no foods that burn up body fat. This is burned only when the total energy intake is reduced to a point at which the body is forced to draw on its own stores for fuel. Furthermore, the time of the day when food is eaten has nothing to do with the production of body fat. Regardless of the number of meals eaten, the total energy value of the day's food intake will determine whether the diet is fattening or reducing.

The expression "Provides energy" or "Furnishes energy" is acceptable when it is clearly indicated by appropriate modifying phrases that "food energy" or "calories" is meant. In general, ordinary foods except water and common salt are sources of energy. Statements of calories per unit weight are useful as indicating relative economy of different foods as sources of energy, but for healthy persons calories from one food are not to be regarded as of more value than those from any other food.

"Blood Building."—Iron is an important element in blood formation, since it is a chemical component of hemoglobin, the coloring substance of red blood corpuscles. Other substances

taking part in hemoglobin generation are pigment-complexes, parent substances of the hemoglobin molecule, and copper in minute traces. It is important to point out that iron, copper and the pigment-complexes are concerned only with hemoglobin formation. They in no way contribute to the many other constituents of the blood, some of which are in solution, such as other mineral salts, proteins, amino acids and dextrose, and some in suspension, such as white blood corpuscles, platelets and the stroma of red blood corpuscles. Even the red blood cell stroma is only indirectly affected by iron and copper. In secondary or nutritional anemia the red corpuscles decrease because they have no pigment to carry. Their number will increase, however, with an increase of hemoglobin, provided there is no impairment of the cell-forming mechanism. It is thus evident that the food supply of iron and copper affects only the hemoglobin content of blood.

The whole process of blood regeneration is complex, involving many factors that may be affected by pathologic or disease conditions as well as by adequacy or inadequacy of the diet in iron. Anemia is a condition in which the blood is deficient in hemoglobin. It may be due to an inadequate diet, but pathologic conditions are frequently involved. Anemia and blood regeneration are not appropriate subjects for advertising addressed to the public. Blood-building claims, therefore, should be excluded from food advertising.

"Mastication."—Claims that the mastication of specific foods "keeps the teeth and gums clean and healthy" and equivalent statements are meaningless, misleading and deceptive by implication and are not permissible.

"Sleep Inducing."—Sleep-inducing claims are not permissible for specific food beverages because of their misleading character implying the possession of unique sleep-inducing properties by the specific individual foods and because they lead to grossly deceptive advertising practices. No objection is taken to statements averring the relaxation value of hot drinks at bedtime for inducing sleep and accompanied by recommendation for the particular food drink for this purpose.

"Resistance."—Food advertising abounds with vague "resistance" claims. Certain foods or their constituents are alleged to increase "resistance," implying body "resistance," which popularly signifies ability of the individual to keep well or healthy or not to suffer untoward effects from bacteria, infections, fatigue, exposure to cold and wet, loss of sleep, and the like.

A healthy body is free from disease; it and its parts function normally. The tissues are physiologically sound, body cells function efficiently, there are a normal production of internal secretions or hormones, and a normal power to produce immunity antibodies, and the many reactions of metabolism proceed without interference. Such a healthy body possesses a maxi-

mum "resistance" for the particular individual. Any influence disturbing its functioning, metabolism or structure may adversely affect "resistance." The potency and duration of the disturbing factor determine the degree of the breakdown of "resistance" and consequent effect on health. Slight but insidious disturbances may continue a long time before signs of positive ill health appear.

Scientific, clinical and common experience shows that adequate nutrition (water, minerals, vitamins, proteins, lipins, carbohydrates and roughage adequate in kinds and amounts), exercise, rest, hygienic environment and sane habits are among the important requisites for maintaining "resistance" and the conditions of health. There are, however, many other intangible and undefined prerequisites.

It is apparent that "resistance" depends on many other factors than diet or any one dietary essential. Insufficiency of a dietary essential may eventually break down health; but more than is necessary of one or more of these essentials for adequate body reserves does not lead to a "super-resistance." "Resistance" produced by adequate nutrition is not to be confused with immunity resulting from antibodies in the body fluids produced by the body cells in their defensive reaction against pathogenic organisms and their toxins. Food advertising should conform to this established knowledge.

"Minerals."—Vague or nonspecific mineral claims or statements in food advertising may, either directly or indirectly, signify or imply the presence of all the nutritionally valuable mineral elements in physiologically significant quantities in the advertised foods. Such vague statements are not properly informative, are misleading and deceptive and promote bad advertising practices. Advertising should correctly, properly and explicitly instruct the public. Mineral claims should stipulate the individual element or elements intended for attention. Elements not present in nutritionally significant amounts in a food and in the quantity of the food likely to be consumed in the diet do not warrant mention. Mineral claims should name those elements only which are contributed in substantial physiologic amounts by the respective foods in the quantities ordinarily consumed in the diet.

"Vitamins."—Indefinite or general vitamin claims are vague, noninformative and misleading and do not permit a distinction between foods as sources of the respective vitamins. Vitamin claims shall stipulate the specific vitamin or vitamins present. Vitamins present in a food in insufficient quantity to contribute in any significant manner to the respective vitamin values of the diet do not warrant mention. It is desirable that warranted vitamin claims be expressed in appropriate terms indicative of the relative potency of the food as a source of the vitamins in the dietary schedule. Foods may be considered relatively as fair, good and excellent or rich sources of vita-

mins. Statements of vitamin unitage in numerical quantities per gram (and per ounce if desired), where established, are to be encouraged on container labels in advertising. The type of unit used should be specified. These statements shall be so expressed as not to be misleading.

Examples of the Misuse of Terms

"Acidosis," "Acidity," "Acid."—The words "acidosis," "acidity" and "acid" are frequently used in advertising to play on vague fears of the public. The usual well balanced diet includes many alkali-yielding foods—milk in its various forms, fruits and vegetables. Acid-forming diets are not a practical nutritional problem because a good modern mixed diet adequate in minerals and vitamins can scarcely be potentially acid. It is appropriate to call attention to the fact that certain foods are potentially alkaline, or yield alkaline mineral residues in the body.

Acidosis is a medical name for a morbid condition of diminution in the reserve supply of fixed alkali in the blood and body fluids. Most people have no conception of the true meaning of the word and are quite likely to confuse it with gastric hyperacidity or "acid stomach," or to conceive of it as "acid blood," a condition which would be incompatible with life. The term "acidosis" is so little understood that its use in any advertising except that restricted to the medical profession is misleading and consequently disapproved.

"Adequate."—The term "adequate" in connection with vitamin, mineral or other nutritional claims in food advertising shall be used with its correct scientific significance. The term is permissible only in connection with definite and stated quantities of food containing the adequate quantity and then only when the claim for adequacy is supported by established knowledge.

"Balanced," "Scientifically Balanced."—The terms "balanced" and "scientifically balanced" as applied to individual foods or to their carbohydrate, protein, fat, vitamin and mineral content are vague in meaning, are usually unsupported by fact, and are misleading by implying that the respective nutritional elements are naturally or purposefully proportioned one to another to provide special or unique nutritional values which adapt the foods to specific uses. Claims that individual foods are superior because of assumed "balanced" composition are misleading for the reason that no one food is expected to be taken alone or to compose the complete diet and, when admixed with other foods, any assumed or actual "balance" is destroyed in unknown ways.

Presumably the term "balanced" as used in advertising for any one food is intended to signify either that it is a complete diet containing ideal proportions of proteins, minerals, vitamins, fats and carbohydrates for optimum nutrition or that two or more

of its food essentials content are ideally proportioned to meet optimum nutrional needs. The intended significance, whatever it may be, should be explicitly stated; however, such statements shall be used only if correct for the food as used in the diet. The term "balanced" shall be used only in properly informative statements where its meaning is plainly evident and free of misleading implications.

"Best," "Ideal," "Richest."—Terms expressing or inferring exactness of comparison which is not scientifically or technically warranted or in accord with fact are not permissible.

"One of the best" instead of *"the* best," *"an* ideal" instead of *"the* ideal" and *"one* of the richest" instead of *"the* richest" exemplify possible acceptable claims in instances in which the specific superlative statement is not permissible.

"Cream."—There have appeared on labels and in advertising for various brands of evaporated milk certain statements which the Council believes are undesirable, such as "use evaporated milk instead of cream," "for all your cream needs" and "use as cream." Although evaporated milk is often useful as a culinary aid in situations in which cream is commonly used, the composition of evaporated milk differs from that of cream; statements that imply that evaporated milk is practically the same as cream are nutritionally incorrect and misleading. The claim that evaporated milk has the "consistency of cream" may be correct from a physical point of view; however, the Council regards the expression as objectionable because of the suggestion of similar nutritive properties. The use of evaporated milk in tea and coffee and for other purposes can be suggested without recourse to the word "cream."

"Diabetic Foods," "Special Foods for Sugar and Carbohydrate Restricted Diets."—There is authoritative evidence that commercially prepared special "diabetic foods" are of limited usefulness to the diabetic patient and that the availability of insulin makes them no longer necessary. Artificial substitutes for ordinary foods are not to be favored; it is much better for the diabetic patient to learn how to plan his diet with foods in common use and readily available. The designation of a food as a "diabetic food" merely because it is low in carbohydrates is now unwarranted and misleading and gives the erroneous impression either that the food taken in unrestricted quantities in diabetes is harmless or that it has remedial action. Except for the necessity of restricting foods to avoid overstepping the food tolerance, there are no special diabetic nutritional requirements. The exploitation of starch-free or low carbohydrate foods containing an excess of protein for use by diabetic patients is unwarranted. Protein may be tolerated almost as poorly, if not quite as poorly, as starch in diabetes.

Lay advertising for these special foods should not include disease names such as diabetes nor directly or indirectly indicate

that the foods are curative or increase the ability of the body to utilize sugar, or give the impression of harmlessness when eaten in unrestricted amounts by diabetic patients. Foods marketed for the sick with diabetes should not be advertised to the public except under the restriction just stated; advertising of a medicinal or therapeutic character should be limited to medical periodicals or material for physicians exclusively.

"Doctor," "M.D." as Integral Parts of Names of Foods.—Names of foods including the academic title "Doctor" or "M.D." accompanied or unaccompanied by the name of a person lend themselves to misleading or deceptive advertising of a medicinal, quasimedicinal or therapeutic character and are not permissible for accepted products unless the product was established on the market, and the name of the firm included the title "Doctor" or "M.D.," prior to the institution of this decision (May 1933).

"Food Concentrate," "Scientific Food Concentrate."—The terms "food concentrate" and "scientific food concentrate" are common designations in current advertising for food mixtures consisting mainly of sucrose, malt extract and cocoa, with a relatively small proportion of dried milk or skim milk and possibly a small quantity of dried egg. These mixtures are used chiefly for preparing chocolate-flavored and malt-flavored sweetened milk drinks.

The designations as used, implying a direct process of concentration in the manufacture of the foods concerned, are unnecessary for describing the products, are likely to be misunderstood by the public, are not informative, incorrectly convey the meaning of extraordinary food value, and are misleading by implication. The foods to which they are applied are no more "concentrates" or "scientific concentrates" than are sugar, dried milk, butter and other common foods.

Dried foods and partially evaporated foods are simply and clearly described as such. Little understood and vague terms should not be employed for describing foods to the public. Directly informative statements about foods protect the interests of the public and of manufacturers in food purchasing and selling. The term "concentrate" should be reserved for concentrated solutions of flavors or fruit juices which must be diluted for use, for highly potent vitamin preparations, or for concentrated extracts of foods which are recognized technically as concentrates and for which products the term "concentrate" is not misleading in fact or by connotation. It is appropriate to describe certain evaporation methods for preparing such foods as evaporated milk or malt extract syrup as concentration processes.

"Health," "Healthful."—The term "health food" and equivalent claims or statements to the effect that a food gives or assures "health" are vague, misinformative and misleading. An adequate or complete diet and the recognized nutritional essentials established by the science of nutrition are necessary for health, but

health depends on many other factors than those provided by such diet or nutritional essentials. No one food is essential for health; there are no "health foods." Statements of well established nutritional or physiologic values of foods are permissible.

The term "healthful" is frequently encountered in food advertising. As used, it commonly means that the food described corrects a possible nutritive deficiency or some abnormal condition in such a manner as actively to improve health. It incorrectly implies that the food possesses unique or unusual health-giving properties. The term has a popular specific "health food" significance which makes its use in advertising misinformative and misleading.

"Healthful" and "wholesome" by dictionary definition have almost identical meanings; the former, however, intimates an *active* significance, whereas the latter signifies quality or condition. "Wholesome" indicates that a food so described is sound, clean, fit for consumption and free of any objectionable qualities; it is appropriate for characterizing foods fulfilling these qualifications and should replace "healthful" as used in food advertising.

Statements or claims in food advertising with technical, scientific, nutritional, physiologic or "health" significance shall be carefully phrased so as to be in complete accord with established knowledge and authoritative opinion, and shall be free from misleading or incorrect popular implications or interpretations.

"Sterile," "Sterilized," "Sterilization."—The terms "sterile," "sterilized" and "sterilization" shall be used in food advertising in their correct scientific significance only. Foods processed to be free of pathogenic organisms or to keep sound and wholesome are not necessarily sterile, i. e., free from viable microorganisms.

"Tonic."—The term "tonic" or its inflected forms have vague and misleading meanings or implications in food advertising and are not permissible.

"Whole Wheat," "Entire Wheat," "Graham."—The terms "whole wheat," "entire wheat" and "graham" as applied to flour and to bread are synonymous. In harmony with this understanding, these terms shall be used as food names or as parts of food names only when the sole cereal and farinaceous ingredient is whole wheat. Their use as names for foods with other composition is misinformative and misleading. Descriptive food names should correctly and properly identify the nature of the foods.

SECTION II

Fats and Oils and Their Products

The average American diet has been estimated to provide from 25 to 35 per cent of its calories in the form of fat, or approximately 80 to 130 Gm. of fat daily for the adult. An oil, according to common usage, is a fat that is liquid at ordinary temperatures. Fats and oils of animal and vegetable origin have been prepared since the earliest times by churning milk, rendering the fatty tissue of animals or expressing oils from olives, corn or seeds, such as sesame, rape, cottonseed, peanut or cacao. Fat not only is used in relatively pure form but is present to some extent in many natural foods.

Chemical Composition.—Chemically a fat molecule is a triglyceride, that is, a compound of glycerol and three molecules of fatty acid. A triglyceride may have the three fatty acid radicals alike as in palmitin, stearin and olein, or it may have different fatty acids. So-called mixed triglycerides are compounds containing different fatty acid radicals in the same molecule. They have been isolated from lard, beef fat and mutton tallow, fat of the human body, and cacao butter. Naturally occurring fats and oils are mixtures of glycerides. However, the composition of fats and oils is, within limits, characteristic of the source. Discussions of the chemistry of fats are available in a number of special monographs on this subject.

The properties of a fat are determined by the characteristics of its component fatty acid radicals. The fatty acids may be classified in two general groups: saturated, in which all the valence bonds of the carbon atoms are satisfied, and unsaturated, in which there are one or more pairs of doubly linked carbon atoms in the chain. The degree of unsaturation is indicated by the iodine number, which is greater in proportion as the fat is unsaturated. The relative length of the carbon chains of the fatty acid radicals is indicated by the saponification number. The higher this value, the greater the proportion of short chains. The proportion of acids of shorter length, which are volatile with steam and soluble in water, is indicated by the Reichert-Meissl number. The melting point is dependent on other properties; unsaturation and shortness of carbon chains make for a lower melting point. The fatty acids of practically all naturally occurring fats contain an even number of carbon atoms.

Retardation of the Development of Rancidity.—Fats and oils are relatively unstable and under certain conditions tend to "spoil" or become rancid, as the result of the action of enzymes

or catalysts which normally are present. While this change is accompanied by alterations in the fat molecule, rancidity is detected more readily by odor or taste than by chemical tests. The prevention of the development of rancidity is an important problem in the preservation of foods, not only of fats and oils, but of many cereals, crackers, nuts, coffee and other food products which naturally contain fats. The chemical reactions involved in the production of rancidity are those of oxidation and hydrolysis. These changes are favored by heat, light of certain wavelengths and the presence of free fatty acids. Rancidity in fats may be accompanied by the destruction of vitamin A. Efforts to prevent or retard rancidity have been directed toward the avoidance of the conditions that promote it. Thus, in the refining of fats and oils, free fatty acids are removed; in the packaging of foods, containers that exclude air and light may be used, and in the keeping of foods, refrigeration is employed. All these methods retard rather than prevent the development of rancidity. Numerous patents have been granted for the use of chemical substances as "stabilizers," or antioxidants, which are substances capable of retarding the development of rancidity in oils and fats.[1] On the other hand some foods contain antioxidants. They have been shown by Mattill [2] to exist in a variety of vegetable foods. Recently, cereal flours have been suggested as antioxidants for foods which are prone to acquire unpleasant flavors. The value of cereal flours as antioxidants has been partially described in certain United States patents.[3] Oat flour has found particular favor because of its low price and reported effectiveness in preventing the rancidity which is responsible for the disagreeable flavor.[4] It has been used to provide protection for potato chips, peanuts, candy, coffee, various oils and other foods.[5] Special preparations of oat flour are being marketed for application to food materials by (*a*) intimate mixing or fusion, as with lard, oleomargarine and peanut butter; (*b*) dusting or coating, as with potato chips or salted nuts, or (*c*) coating paper or other packaging material which comes into contact with foodstuffs such as butter, lard, bacon, coffee and similar products.

---

1. Substances proposed have included carotenoid pigments (U. S. patent 1,890,589, Dec. 13, 1932), lecithin (U. S. patent 1,575,529, March 2, 1926), hydroxypolybasic aliphatic acids (U. S. patent 1,805,458, May 12, 1931), furfural (U. S. patent 1,680,047, Aug. 7, 1928), unsaturated polybasic aliphatic acid (U. S. patent 1,898,363, Feb. 21, 1933) and gum guaiac (U. S. patent 1,903,126, March 28, 1933).
2. Mattill, H. A.: Antioxidation and the Autoxidation of Fats, J. Biol. Chem. **90**: 141 (Jan.) 1931.
3. Broadly, these patents describe a food product carrying a "coating of vegetative antioxidative substance" (U. S. patent 2,026,697, Jan. 7, 1936), any animal tissue carrying such a coating (U. S. patent 2,029,248, Jan. 28, 1936), packaging material coated with antioxidative cereal or seed materials (U. S. patent 2,038,752, April 28, 1936), and the stabilization of fatty glycerides with cereal antioxidants (U. S. patent 2,049,017, July 28, 1936).
4. Peters, F. N., and Musher, S.: Oat Flour as an Antioxidant, Indust. & Engin. Chem. **29**: 146 (Feb.) 1937.
5. Lowen, L.; Anderson, L., and Harrison, R. W.: Cereal Flours as Antioxidants for Fishery Products, J. Indust. & Engin. Chem. **29**: 151 (Feb.) 1937.

Digestion.—In the course of digestion the fat of the food is emulsified and saponified. In the stomach, fat undergoes only slight changes, which are limited to the partial hydrolysis of the highly emulsified and the more soluble glycerides of the lower fatty acids. In the intestine fat becomes mixed with bile, which promotes emulsification and solution of the fat and its products of hydrolysis. This emulsification of fat exposes a greater surface to the fat-splitting enzymes of the digestive juices secreted by the pancreas and the small intestine. The action of these enzymes is to hydrolyze the fat, forming glycerol and fatty acids. The mechanism of the absorption of the fatty acids has long been disputed and is even now not well established. The prevailing conception is that the fatty acids form with the bile acids stable complexes, which are diffusible and may be absorbed by the intestinal membrane. Here the complexes are split, and the fatty acids may become incorporated temporarily in the phospholipid of the intestinal wall. Eventually, neutral fat is resynthesized and is taken up by the lymph and poured into the blood stream. Some fat is also absorbed directly into the blood stream.

The digestibility and absorbability of fats are difficult to ascertain experimentally with precision, because of the presence of other ether-soluble substances excreted as well as undigested and unabsorbed fat in the stool, but the utilization appears to be high, on the average greater than 90 per cent With the ordinary mixed diet it is customary to assume that the normal person utilizes about 95 per cent of the fat of food. The size of the fat particles of the food appears to be without influence on the proportion of fat absorbed. A low melting point was long thought to affect the degree of absorption. Recent work on infants indicates, however, that melting point per se is not a factor but that with a mixed fat absorption is favored by the presence of fatty acids containing one or more unsaturated linkages and of fatty acids with relatively short carbon chains.[6]

The changes undergone by fat in the process of cooking are inconstant but usually not great. They are likely to depend as much or more on other ingredients of the food, which may contain catalytic agents, as on the conditions of cooking except in cases of superheating. The ordinary changes are probably in the direction of hydroxylation of the double bonds and hydrolysis. There is evidence that the fat of fried food (e. g. doughnuts) if unaltered is as well digested and absorbed as equal amounts of similarly combined fat and carbohydrate in a different form.

6. Holt, L. E.; Tidwell, H. C.; Kirk, C. M.; Cross, D. M., and Neale, S.: Studies in Fat Metabolism, J. Pediat. 6: 427 (April) 1935. Anderson, W. E., and Williams, H. H.: The Role of Fat in the Diet, Physiol. Rev. 17: 335 (July) 1937.

After absorption from the alimentary tract fat either may be stored as reserve fuel in the body or may be hydrolyzed and burned. The combustion of the fatty acid chains takes place by the successive oxidation of the beta carbon atom, which shortens the chain by two carbon atoms at each step. For the last step, which is the utilization of a four carbon chain, the simultaneous oxidation of some carbohydrate is necessary.

Nutritional Significance.—The nutritive value of fats and fatty foods, as of other foods, depends on their ability to provide energy and also on the extent to which they serve as carriers of other necessary food factors. Fat has a higher energy value per unit of weight than any other foodstuff; on combustion 1 Gm. liberates on the average 9.45 calories; allowing 5 per cent for loss in digestion reduces this to a physiologic value of 9 calories per gram. Fat is efficiently converted to depot fat, the only form in which energy is stored in the body to any considerable extent. While all digestible fats are approximately equal in energy content, they differ widely as carriers of other food factors. The fat-soluble vitamins A and D are found abundantly in some fats and are lacking in others. In general, animal fats are superior to vegetable fats as sources of these vitamins.

A meal containing a large amount of fat owes its staying qualities to the physiologic action of fat in the alimentary canal, which induces a feeling of satiety. The presence of fat in the upper sections of the small intestine (duodenum and jejunum) inhibits the muscular and secretory activities of the stomach, apparently by a humoral mechanism. This action causes a delay in the progress of digestion and in the emptying of the stomach. This slowing of digestion is not to be confused with incompleteness of digestion. As has been previously stated, almost all the fat taken into the body is digested and absorbed.

The proportion of fat considered desirable in the diet varies with conditions. During adolescence and under conditions of hard labor, fat is valuable because its high fuel value helps to provide the large amount of necessary energy without overburdening the capacity of the stomach. With certain pathologic conditions the dietary fat may need to be carefully regulated. With diabetes, when carbohydrate and protein are restricted, relatively more fat must be given to provide necessary food energy. In cases of diabetes with hyperlipemia (plasma cholesterol values markedly elevated), high fat feeding may be undesirable. Under these circumstances more carbohydrate must be given to insure adequate food energy; its utilization is insured by administering suitable doses of insulin. In ketogenic diets, as used in the treatment of epilepsy, less than from 20 to 30 Gm. of carbohydrate can be given and a large propor-

tion of fat is required. Ketone bodies are not formed until the ratio of molecules of fatty acid to molecules of dextrose in the mixture of food undergoing combustion exceeds 2 to 1. In disorders of the gallbladder and in pancreatic disease digestion and absorption of fat may be interfered with, and attention must be directed to the fat content of the diet.

BUTTER

Approximately one quarter of the nation's milk supply is used for the preparation of butter, which constitutes more than one third of the edible fat consumed in this country. In its manufacture, cream is usually pasteurized and is ripened under controlled conditions. Ripening is an acid fermentation that develops flavor and aroma and provides for complete churning. It is produced by several types of symbiotic bacteria. The lactic acid–producing organisms flourish in the early stage of the process, raising the acidity to the point optimum for the activity of citric acid–fermenting organisms. The products of bacterial action on citric acid give the characteristic flavor and aroma to butter. Those identified so far are diacetyl, acetylmethylcarbinol and methyl glyoxal. The cream to be ripened is inoculated with the desired organisms by being mixed with a small proportion of "starter," which consists of clean skimmed milk in active lactic acid fermentation. When this method is used the degree of acidity and the intensity of flavor and aroma developed by ripening run parallel. The difficulty of controlling the quality and intensity of the flavor developed has led recently to the practice of distilling the aromatic substances from the starter and adding the distillate to the cream to be churned. By chemical analysis, the distillate can be standardized and flavor can be developed without acidity.

The agitation involved in churning causes the fat globules to clump together into masses large enough to be separated from the buttermilk, which is drawn off. The butter is washed with pure water, salted to improve the flavor and keeping qualities and to aid in removing the buttermilk, and worked to distribute the salt evenly and to press out excess water.

Artificial coloring material is frequently added to butter, usually before churning. Annatto was formerly the principal pigment, but now fat-soluble aniline dye certified by the United States Department of Agriculture is chiefly employed. Declaration of color added to butter is not required by law. According to the regulations of the Food and Drug Administration, butter must contain not less than 80 per cent by weight of milk fat.

In addition to being a palatable, digestible and concentrated source of energy, butter provides significant amounts of vitamin A and contains some vitamin D. There is considerable variation in the vitamin A content of butter as reported by different investigators, due in large measure to differences in

the diet of the cow and the season of the year. Biologic determinations on the basis of the international unit made by English workers show that the vitamin A content of butter ranges from 15 international (U. S. P.) units to the gram for winter butter to about 27 international units to the gram for summer butter,[7] while biologic determinations made by American workers in terms of Sherman units[8] show values of 32 to 36 Sherman (24 to 27 U. S. P.) units to the gram for butter from cows on pasture and from 6 to 32 Sherman (4.5 to 24 U. S. P.) units to the gram for butter from cows stall fed.[9] In view of the wide divergence in figures a value of 20 U. S. P. units of vitamin A to the gram of butter is suggested as a representative figure to use in ordinary dietary calculations.

The vitamin D potency of butter is slight; values range from 0.4 to 1.5 U. S. P. units to the gram.[8] For ordinary dietary calculations the vitamin D content of butter may be disregarded.

The Council recognizes that butter is a most valuable food and that all efforts of producers should be directed to maintain the sanitary and nutritional qualities of the product.

LARD AND HYDROGENATED LARD

Lard as defined by federal standards is "the rendered fresh fat from hogs in good health at the time of slaughter. It is free from rancidity, and contains, necessarily incorporated in the process of rendering, not more than 1 per cent of substances other than fatty acids and fat." Leaf lard is "lard rendered at moderately high temperatures from the internal fat of the abdomen of the hog, excluding that adherent to the intestines, and having an iodine number not greater than 60."

Hydrogenation has the effect of hardening a fat and is employed to improve for shortening purposes the consistency of fat which is liquid at ordinary temperatures. This process is carried out by bringing hydrogen into contact with the heated fat in the presence of a catalyst, at elevated temperature and pressure. After the iodine number has been lowered sufficiently, the catalyst is completely removed by double filtration. The filtered fat is treated with steam at high temperature and under

---

7. Fixen, M. A. B., and Roscoe, M. H.: Tables of the Vitamin Content of Human and Animal Foods, Nutrition Abstr. & Rev. **7**: 835 (April) 1938.

8. Although no exact relation between the international or U. S. P. unit and the Sherman unit for vitamin A can be given in view of the difference in the principles involved in assays by two methods, it is the consensus of the Council, after reviewing available data, that most probably 1 Sherman unit equals about 0.66 to 0.80 international unit (Report of Annual Meeting of the Council on Foods, J. A. M. A. **111**: 156 [July 9] 1938). For the purpose of this book 1 Sherman unit is considered to equal 0.75 international or U. S. P. unit.

9. Daniel, E. P., and Munsell, H. E.: Vitamin Content of Foods, Miscellaneous Publication 275, United States Department of Agriculture, Bureau of Home Economics, 1937.

vacuum as a deodorizing process. The product is then homogenized, solidified and placed in containers. The hydrogenation of lard is said to improve its keeping qualities.

Lard is not a significant source of vitamins, but may contain traces of vitamin A.

The listed products of the following firms stand accepted:

The Cudahy Packing Company, Chicago.

CLIX BRAND SHORTENING, hydrogenated lard.

Analysis (submitted by manufacturer).—Moisture not over 0.05%, total solids 99.95%, free fatty acids as oleic acid not over 0.03%, iodine value (Wijs method) 59-60, rancidity (Kreis reaction) negative, melting point (closed capillary) 47-49 C., solidifynig point of fatty acids (titer test) 38-39 C.; saponification value 194-196, color (Lovibond 5¼" col. max.) 5YO.2R, smoke point (open cup) min. 435 F., inert gas incorporated 4-8%, keeping quality (hours at 208 F.) ten fifteen.

Calories.—9 per gram; 255 per ounce.

PURITAN BRAND LARD, leaf lard complying with federal standard.

Analysis (submitted by manufacturer). -Moisture 0.10%, total solids 99.9%, free fatty acids as oleic acid 0.25%, iodine value 58, melting point (closed capillary) 46-48 C., solidifying point of fatty acids (titer test) 40-41 C., saponification value 194-196, color (Lovibond 5½" col. max.) 20Y-2R, smoke point (open cup) 365-375 F., rancidity (Kreis reaction) negative, keeping quality (hours at 208 F.) six-eight.

Calories.—9 per gram; 255 per ounce.

MAYONNAISE AND SALAD DRESSINGS

Mayonnaise and other salad dressings are included in this section because most of these products consist largely of oil or contain a larger proportion of oil than of any other ingredient. Mayonnaise is defined by the United States Department of Agriculture Food and Drug Administration as "the semisolid emulsion of edible vegetable oil, egg yolk, or whole egg, a vinegar, and/or lemon juice, with one or more of the following: Salt, other seasoning commonly used in its preparation, sugar, and/or dextrose. The finished product contains not less than 50 per cent of edible vegetable oil."

The kind of oil that goes into mayonnaise is the manufacturers' choice. One accepted brand of mayonnaise contains corn oil, another soybean oil, and two accepted brands contain cottonseed oil. The only federal regulation regarding this point is that it must be an edible vegetable oil.

Salad dressings differ from mayonnaise in several respects. In general, salad dressings may be expected to contain less oil and more carbohydrate (sugar, starch, flour and so forth) and water than mayonnaise. The oil content of salad dressings that stand accepted by the Council on Foods ranges from 35 to 43 per cent. Because salad dressings contain less oil, they yield fewer calories.

In the preparation of products of this group, formula proportions of the ingredients are emulsified. For some products the mixture is homogenized also.

The listed products of the following firms stand accepted:

Chicago Dietetic Supply House, Inc., Chicago.

CELLU BRAND MAYONNAISE SALAD DRESSING, containing soy bean oil eggs, vinegar and sodium chloride.

Analysis (submitted by manufacturer).—Moisture 13.4%, total solids 86.6%, ash 0.4%, fat (ether extract) 83.4%, protein (N × 6.25) 2.2%, carbohydrates (by difference) 0.6%.

Calories.—7.6 per gram; 216 per ounce.

Hostess Products Corporation, Long Island City, N. Y.

HOSTESS BRAND MAYONNAISE, containing cottonseed oil, egg yolk, water, vinegar, salt, sucrose, mustard and white pepper.

Analysis (submitted by manufacturer).—Moisture 10.9%, total solids 89.1%, ash 1.2%, sodium chloride (NaCl) 1.1%, fat (ether extract) 84.5%, protein (N × 6.25) 0.9%, carbohydrates (by difference) 2.2%, titratable acidity as acetic acid 0.3%, lecithin phosphoric acid (P_2O_5) 0.058%, unsaponifiable matter 0.3%, estimated egg yolk solids[10] 3.4%.

Calories.—7.7 per gram; 219 per ounce.

HOSTESS NEW BLEND BRAND SALAD DRESSING, containing cottonseed oil, water, vinegar, sucrose, egg yolk, corn starch, sodium chloride, tapioca and mustard seasoning (oil mustard seed).

Analysis (submitted by manufacturer).—Moisture 41.1%, total solids 58.9%, ash 1.8%, sodium chloride (NaCl) 1.4%, fat (ether extract) 42.6%, protein (N × 6.25) 0.9%, reducing sugars as invert sugar 5.5%, carbohydrates other than crude fiber (by difference) 13.6%, titratable acidity as acetic acid 1.0%, lecithin (as P_2O_5) 0.047%, total phosphorus (as P_2O_5) 0.122%, estimated egg yolk solids 2.8%.

Calories.—4.4 per gram; 125 per ounce.

John F. Jelke Company, Chicago.

JELKE'S GOOD LUCK BRAND FRENCH DRESSING, containing cottonseed oil, vinegar, sucrose, water, spices (paprika, mustard, onion), salt and tragacanth (U. S. P.).

Analysis (submitted by manufacturer).—Moisture 39.6%, total solids 60.4%, ash 4.0%, sodium chloride (NaCl) 3.8%, fat (ether extract) 35.5%, protein (N × 6.25) 0.6%, reducing sugars as invert sugar 2.1%, sucrose (copper reduction method) 16.0%, crude fiber 0.3%, carbohydrates other than crude fiber (by difference) 18.7%, titratable acidity as acetic acid 1.3%, lipoid phosphoric acid (P_2O_5) none, total phosphoric acid (P_2O_5) trace, added color none.

Calories.—4.0 per gram; 114 per ounce.

JELKE GOOD LUCK BRAND MAYONNAISE, containing cottonseed (or corn) oil, eggs, water, sucrose, vinegar, salt and mustard.

Analysis (submitted by manufacturer).—Moisture 23.4%, total solids 76.6%, ash 2.1%, sodium chloride (NaCl) 1.8%, fat (ether extract) 65.4%, protein (N × 6.25) 2.9%, reducing sugars as invert sugar none, sucrose 5.0%, lipoid phosphoric acid (P_2O_5) 0.107%, total phosphoric acid (P_2O_5) 0.111%, carbohydrates (by difference) 5.6%, titratable acidity as acetic acid 0.4%.

Calories.—6.2 per gram; 176 per ounce.

10. Estimated egg yolk solids equals the percentage of lecithin as phosphorus pentaoxide (P_2O_5) in sample times 100, divided by 1.7 per cent, the lecithin as phosphorus pentaoxide (P_2O_5) in egg yolk (dry basis). The figure 1.7 per cent is calculated from the values reported in Official and Tentative Methods of Analysis of the Association of Official Agricultural Chemists, ed. 3, Washington, D. C., Association of Official Agricultural Chemists, 1930, p. 356.

JELKE'S GOOD LUCK BRAND WHIPPED SALAD DRESSING, containing water, cottonseed oil, sucrose, vinegar, starch, eggs, salt and mustard.

Analysis (submitted by manufacturer).—Moisture 38.9%, total solids 61.1%, ash 3.8%, sodium chloride (NaCl) 3.7%, fat (ether extract) 39.8%, protein (N × 6.25) 1.0%, reducing sugars as invert sugar trace, sucrose (copper reduction method) 11.1%, carbohydrates (by difference) 15.7%, titratable acidity as acetic acid 0.8%, lipoid phosphoric acid (P_2O_5) 0.036%, total phosphoric acid (P_2O_5) 0.04%, added color none.

Calories.—4.3 per gram; 122 per ounce.

JELKE GOOD LUCK BRAND SANDWICH SPREAD, containing water, cottonseed (or corn) oil, sweet pickle relish, sucrose, distilled vinegar, corn starch, sodium chloride, eggs, tapioca flour and mustard. While this product is not a salad dressing and should be classified by itself, it is included in this tabulation because of its composition.

Analysis (submitted by manufacturer).—Moisture 42.7%, total solids 57.3%, ash 3.7%, sodium chloride (NaCl) 3.4%, fat (ether extract) 32.6%, protein (N × 6.25) 1.0%, reducing sugar as invert sugar 2.0%, sucrose 12.5%, crude fiber 0.6%, carbohydrates other than crude fiber (by difference) 18.3%, titratable acidity as acetic acid 1.1%, lipoid phosphoric acid as P_2O_5 0.027%, total phosphoric acid as P_2O_5 0.029%.

Calories.—3.8 per gram; 108 per ounce.

JELKE GOOD LUCK BRAND THOUSAND ISLAND DRESSING, containing cottonseed (or corn) oil, water, sweet pickle relish, sucrose, vinegar, chili sauce, eggs, corn starch, salt, tapioca flour, mustard and paprika.

Analysis (submitted by manufacturer).—Moisture 37.0%, total solids 63.0%, ash 5.3%, sodium chloride (NaCl) 4.6%, fat (ether extract) 42.5%, protein (N × 6.25) 1.1%, reducing sugar as invert sugar 5.1%, sucrose (copper reduction method) 4.3%, crude fiber 0.6%, carbohydrates other than crude fiber (by difference) 12.5%, titratable acidity as acetic acid 1.0%, lipoid phosphoric acid (P_2O_5) 0.042%, total phosphoric acid (P_2O_5) 0.045%, estimated egg yolk solids, 3.8%.

Calories.—4.4 per gram; 125 per ounce.

McCormick & Company, Inc., Baltimore.

MCCORMICK'S BRAND MAYONNAISE, containing corn oil, egg yolk, vinegar, salt, sucrose, mustard and paprika.

Analysis (submitted by manufacturer).—Moisture 15.9%, total solids 84.1%, ash 1.1%, sodium chloride (NaCl) 1.0%, fat (ether extract) 79.4%, protein (N × 6.25) 1.5%, sucrose 1.1%, crude fiber none, carbohydrates (by difference) 1.6%, titratable acidity as acetic acid 0.5%, lipoid phosphoric acid (P_2O_5) 0.064%, total phosphoric acid (P_2O_5) 0.107%.

Calories.—7.3 per gram; 207 per ounce.

OILS

Corn (maize) oil is the refined fixed oil expressed from the germ of Zea mays Linné (fam. Gramineae). Corn oil is prepared commercially from hot, dry germ which has been segregated from the treated kernel. The pressed oil is refined by being filtered several times, treated with fuller's earth and decolorizing carbon, steamed and cooled to about 5 C. to precipitate undesirable substances. It is not a significant source of vitamins but contains traces of vitamin A.

Cottonseed oil is the refined oil of Gossypium herbaceum Linné (fam. Malvaceae). It is more widely used in this country than any other vegetable oil. Some persons appear to be sensitive to it. Whether the cottonseed oil itself or

some impurity is the cause of the reaction is not established. Cottonseed oil is without value as a source of vitamins.

Oleo oil is the fat from the caul, heart and kidneys of freshly killed beeves. It contains small amounts of vitamins A and D.

Olive oil is the fixed oil obtained from the ripe fruit of Oleo europaea Linné (fam. Oleaceae). It has been shown to be readily digested and absorbed by the alimentary tract. It is a negligible source of vitamins. In the manufacturing process selected, mature Spanish, Italian or California olives are used. The European oil is extracted by cold pressing, and only the oil from the first pressing is used for the brands of olive oil which stand accepted. This is filtered and blended. The California olives are ground, and pressed in hydraulic presses without crushing the pits. The oil is allowed to settle and, after being filtered, is aged for about six months.

Olive oil is sometimes adulterated with cheaper oils. Common adulterants used are the oils of cottonseed, peanut, sesame seed and soya bean and, more recently, teaseed oil. At present cottonseed, sesame and peanut oils are not commonly used because they are so easily detectable and provable by appropriate tests. Refined teaseed oil, however, from the Oriental teaseed nut, possesses chemical constants practically identical with olive oil. Because of this fact it is impossible to detect teaseed oil used as an adulterant of olive oil with the tests described in the United States Pharmacopeia XI, although the Fitelson test [11] readily demonstrates the presence of teaseed oil. This test is specific and characteristic for teaseed oil and is not given by the other common edible vegetable oils.

In a court case tried in Philadelphia in March, 1937, the court held that a product labeled U. S. P. olive oil was not misbranded if the oil complied with the tests described in the Pharmacopeia. Other courts have ruled differently on similar cases. However, the addition of teaseed oil to olive oil unless declared on the label is an adulteration in view of the existing federal definition for olive oil. The Council requires that firms furnish evidence that teaseed oil, as well as other adulterant oils, is absent from the product under consideration before acceptance is granted.

The listed products of the following firms stand accepted:

E. Cerruti, Inc., New York. See Tomaso Moro & Figli, Genoa, Italy.

Corn Products Refining Company, New York.
MAZOLA BRAND REFINED CORN OIL.

Ehmann Olive Company, Oroville, Calif.
CALIFORNIA EHMANN and EHMANN BRANDS OLIVE OIL.

H. J. Heinz Company, Pittsburgh.
HEINZ BRAND VIRGIN IMPORTED OLIVE OIL.

11. Fitelson, J.: A Colorimetric Method for the Detection of Teaseed Oil in Olive Oil, J. A. Off. Agric. Chemists **19**: 493 (Aug.) 1936.

Mencacci & Company, Inc., Jamaica, N. Y. *See* Tomaso Moro & Figli, Genoa, Italy.

Strohmeyer & Arpe Company, New York.
RE UMBERTO BRAND VIRGIN IMPORTED OLIVE OIL.

Supreme Olive Oil Corporation, San Fernando, Calif.
BENEDETTO BRAND OLIVE OIL.

Tomaso Moro & Figli, Genoa, Italy, product distributed by Mencacci & Company, Inc., Jamaica, N. Y., and E. Cerruti, Inc., New York.
MORO BRAND VIRGIN OLIVE OIL.

OLEOMARGARINE

Oleomargarine was first made in 1869 in response to an offer by Napoleon III of a prize for a nutritious and appetizing form of fat for table use. Some of the steps in the original method of manufacture are retained in modified form in the present day preparation of oleomargarine. The essential features of current manufacturing methods are blending of fats and oils, to yield a product of the desired physical properties, and agitating with ripened skimmed milk, to produce an agreeable flavor. Brands of oleomargarine vary in composition according to the fats and oils which are used and according to differences in details of manufacturing methods, but essentially they consist of approximately 85 per cent fat, 1.5 per cent sodium chloride, 13 per cent moisture and traces of ash, protein and lactose derived from the cultured skimmed milk in which the fats have been churned. Oleomargarine has been defined for purposes of taxation as anything made in imitation of butter. It is a requirement of the United States Food and Drug Administration that oleomargarine shall contain not less than 80 per cent of fat by weight.

Oleomargarine is much more extensively used on the European continent than it is in the United States. In some states it has been claimed that the amount of taxes applied to oleomargarine virtually prohibits the sale of the product.

Manufacture.—The fats and oils most commonly used as ingredients of oleomargarine include cottonseed, coconut, babassue, soy bean, and oleo oils. Small amounts of neutral lard, palm oil, palm kernel oil, peanut oil and sesame oil are also used. It has become customary to classify oleomargarine according to the source of the oil or fat which is used. Thus "animal fat oleomargarines" are made from animal fats, such as lard and oleo oil. Sometimes products are designated by the trade as animal fat oleomargarines when they contain small amounts of vegetable oils or fats. For those oleomargarines containing oils and fats derived from vegetable sources the term "vegetable margarine" is frequently employed. "Nut margarines" are made from nut oils and should contain no cottonseed or soy bean oil or oil from any source other than nuts. Strictly speaking, peanuts and coconuts are not nuts, but it is common

practice to regard the oils from these sources as nut oils. Manufacturers have been accustomed to varying the qualitative composition of their products by using different oils or fats, depending on prices and availability of raw materials and on other factors. Palm oil is little used as an ingredient of oleomargarine because its high color content may render the oleomargarine yellow enough so that the finished product is subjected to taxation as a "colored margarine."

In the manufacture of oleomargarine the fats and oils, some of which may be partially hydrogenated, are blended so that the final product will have the desired physical properties. The oils are highly refined and deodorized to insure a bland flavor and good keeping qualities. They are melted, thoroughly mixed and churned with pasteurized milk that has been ripened by inoculation with suitable organisms. (See discussion of the production of flavor under "Butter.") Small amounts of emulsifying agents and salt are added to the mixture. Frequently sodium benzoate is added as a preservative. (The amount of sodium benzoate added must be declared on the label.) The product is then solidified by chilling. The details of the manufacturing processes need not be discussed for the present purposes.

The emulsifying agents which are chiefly used in the manufacture of oleomargarine are inorganic phosphates, lecithin, and, more recently, a "derivative of glycerin" sold under the trade name "Emargol."

The inorganic phosphates consist usually of a mixture of disodium phosphate (Na_2HPO_4) and trisodium phosphate (Na_3PO_4). Lecithin is a lipid found in many plant and animal tissues. It occurs in appreciable quantities in egg yolk. At the present time, however, most of the lecithin available commercially is derived from the soya bean. Emargol is a synthetic product. It is claimed that it consists of sodium monostearosulfoacetate, although the patent under which it is made describes not only this compound but a number of other substances, some of which are inedible. Reports of experiments indicate that sodium monostearosulfoacetate should be digested to glycerin, stearic acid and sodium sulfoacetate, the first two of which are harmless and the third of which appears to be excreted unchanged. It is considered improbable that sodium sulfoacetate in quantities likely to be ingested would have any toxic effect, either acute or cumulative, although no direct experiments concerned with either the digestion or fate in metabolism of this "derivative of glycerin" are available. The Bureau of Animal Industry of the United States Department of Agriculture has jurisdiction over the production of animal fat oleomargarine and has permitted the incorporation of as much as 0.5 per cent of sodium monostearosulfoacetate as an emulsifying agent.

The Council regards the name "derivative of glycerin" as nonspecific, indefinite and somewhat misleading, because it

TABLE 1.—*Composition of Oleomargarines (Submitted by Manufacturers)*

Brands	Moisture, %	Total Solids, %	Ash, %	Sodium Chloride, %	Fat,‡ %	Protein,§ %	Carbo-hy-drates,‖ %	Sodium Ben-zoate, %	Sodium Monostearo-sulfo-acetate, %	Calories Per Gm.	Calories Per Oz.
Best Foods, Inc.											
Nut Fat.—Holiday. Vegetable* Fat.—New Nucoa†	13.0	87.0	3.1	3.0	82.0	0.9	1.0	0.1	....	7.46	212
Cudahy Packing Co.											
Animal* Fat.—Anchor, Golden Crest, Mayflower, Ohio Maid, Sunlight, Wisconsin Maid	13.6	86.4	3.5	3.5	81.9	0.3	0.7	0.1	....	7.41	210
Animal* Fat.—Maybelle	15.4	84.6	3.3	3.3	80.3	0.3	0.7	0.1	....	7.27	206
Nut Fat.—Anchor Nut, Golden Crest, Ohio Maid, Rex Nut, Sunlight Nut, Wisconsin Maid Nut	15.0	85.0	2.7	2.6	81.4	0.4	0.5	0.1	0.75	7.36	209
Nut* Fat.—Maybelle, Palm, Rex	15.0	85.0	2.7	2.6	81.4	0.4	0.5	0.1	¶	7.36	209
Vegetable Fat.—Anchor, Golden Crest, Maybelle, Ohio Maid, Sunlight, Wisconsin Maid	14.0	86.0	2.7	2.6	81.5	0.8	1.0	0.1	....	7.41	210
Vegetable Fat.—Southern Maid	15.0	85.0	2.7	2.6	81.4	0.4	0.5	0.1	0.37	7.36	209

Durkee Famous Foods, Inc.											
Animal* Fat.—Durkee's	15.8	84.2	8.1	8.0	80.0	0.5	0.6	None	0.4	7.24	206
Nut* Fat.—Dinner Bell, Durkee's, Durkee's Bo-Kay, My Own, Tasti, Troco	15.4	84.6	3.3	3.2	80.3	0.5	0.6	0.1	0.4	7.27	206
Vegetable Fat.—Durkee's Vegetable	14.8	85.2	3.5	3.2	80.1	0.4	0.5	0.1	0.5	7.25	206
J. H. Filbert, Inc.											
Animal* Fat.—Honey Gold, Our Banquet, Sea Gull, Southern Belle	14.9	85.1	2.1	Present	81.3	1.5	0.2	...	0.2#	7.39	210
Nut* Fat.—Economy, Mar-Via, Nu Blend	16.0	84.0	2.1	Present	80.3	1.3	0.3	0.1	0.2#	7.29	207
Vegetable Fat.—Mrs. Filbert's, New Honey Gold, Southern Belle	15.8	84.2	2.1	Present	80.5	1.8	0.3	0.1	0.2#	7.31	208
John F. Jelke Co.											
Nut* Fat.—Delicia	17.6	82.4	3.5	8.4	78.5	0.3	...	..	**	7.08	201
Vegetable Fat.—Jelke's Good Luck Vegetable†	12.5	87.5	0.1	...	82.7	0.9	...	...	....	7.48	212
Swift & Company											
Animal* Fat.—Allsweet. Nut* Fat.—Gem	14.0	86.0	...	3.2	81.4	0 6	0.7	0.1	...	7.38	210

* Predominantly.
† Fortified with vitamin A. The amount of vitamin A is given in the description of each product.
‡ Ether extract.
§ N × 6.25.
‖ By difference.
¶ 0.37 per cent of formula is sodium monostearosulfoacetate.
# 0.5 per cent of formula is sodium monostearosulfoacetate.
** 0.64 per cent of formula is sodium monostearosulfoacetate.

includes all fats and lecithin; the Council requires that the more definite chemical name "sodium monostearosulfoacetate" be listed in the enumeration of ingredients in oleomargarine and other food products in which this product is used as an emulsifying agent.

Oleomargarine is used in the manufacture of some food products, in cooking and as a table fat. Oleomargarine unless fortified with vitamin A usually is nearly devoid of this factor. Some fats, notably oleo oil, which is the fat from the caul, heart and kidneys of freshly killed beeves, furnishes some vitamin A and vitamin D. Oleomargarine containing large amounts of oleo oil has been shown to provide appreciable quantities of vitamin A. Oleomargarine is chiefly valuable as a source of fat.

Digestibility.—Oleomargarine compares favorably with other fats in digestibility. Holmes [12] reported the average digestibility of three different types of oleomargarine as 97.2, 93.4, and 96.8 per cent. Recently Deuel [13] reported that the average coefficient of digestibility of a brand of oleomargarine was 96.7 per cent. This figure and those reported by Holmes are practically identical with average coefficient of digestibility figures for butter and other food fats: Butter 97 per cent; [14] olive oil, 97.8 per cent; cottonseed oil, 97.8 per cent; peanut oil, 98.3 per cent; cocoanut oil, 97.9 per cent; sesame oil, 98.0 per cent and cocoa butter, 94.9 per cent.[15]

The listed products of the following firms stand accepted:

The Best Foods, Inc., New York.

HOLIDAY BRAND OLEOMARGARINE, containing coconut and peanut oils, cultured milk, salt and sodium benzoate.

NEW NUCOA BRAND OLEOMARGARINE, *See* "Oleomargarine Fortified with Vitamin A."

The Cudahy Packing Company, Chicago.

ANCHOR, GOLDEN CREST, MAYBELLE, OHIO MAID, SUNLIGHT and WISCONSIN MAID BRANDS OLEOMARGARINE, containing oleo and cottonseed oils, cultured skimmed milk, salt and sodium benzoate.

ANCHOR NUT, REX NUT, SUNLIGHT NUT, WISCONSIN MAID NUT, GOLDEN CREST and OHIO MAID BRANDS OLEOMARGARINE, containing coconut and peanut oils, cultured milk, salt, sodium monostearosulfoacetate as emulsifying agent and sodium benzoate.

ANCHOR, GOLDEN CREST, MAYBELLE, OHIO MAID and WISCONSIN MAID BRANDS OLEOMARGARINE, containing cottonseed oil, cultured skimmed milk, salt and sodium benzoate.

MAYBELLE, PALM and REX BRANDS OLEOMARGARINE, containing coconut and cottonseed oils, cultured skimmed milk, salt, sodium monostearosulfoacetate as emulsifying agent and sodium benzoate.

---

12. Holmes, A. D.: Digestibility of Oleomargarine, Boston M. & S. J. **192**: 1210 (June 18) 1925
13. Deuel, H. J.: Communication to Council on Foods, May 7, 1938.
14. Langworthy, C. F., and Holmes, A. D.: Digestibility of Some Animal Fats, Bulletin 310, United States Department of Agriculture, 1915.
15. Langworthy, C. F., and Holmes, A. D.: Digestibility of Some Fats, Bulletin 505, United States Department of Agriculture, 1917.

SOUTHERN MAID BRAND OLEOMARGARINE, containing cottonseed oil, cultured skimmed milk, salt, sodium monostearosulfoacetate as emulsifying agent and sodium benzoate.

Product distributed by the Cudahy Packing Company, Los Angeles.

SUNLIGHT BRAND OLEOMARGARINE, containing cottonseed oil, cultured skimmed milk, salt and sodium benzoate.

Durkee Famous Foods, Chicago, and Norwalk Ohio. Divisions of the Glidden Company, Chicago

DURKEE'S, DURKEE'S BO-KAY, DINNER BELL, MY OWN and TASTI BRANDS OLEOMARGARINE, containing coconut and cottonseed oils, cultured milk, salt, sodium monostearosulfoacetate as emulsifying agent and sodium benzoate.

DURKEE'S BRAND OLEOMARGARINE, containing oleo and cottonseed oils, neutral lard, cultured milk, salt and sodium monostearosulfoacetate as emulsifying agent.

DURKEE'S BRAND VEGETABLE OLEOMARGARINE, containing cottonseed oil, cultured milk, salt, sodium monostearosulfoacetate as emulsifying agent and sodium benzoate.

J. H. Filbert, Inc., Baltimore.

ECONOMY, NU-BLEND and MAR-VIA BRANDS OLEOMARGARINE, containing coconut oil and cottonseed or soy bean oil, or both, cultured milk, salt, sodium monostearosulfoacetate as emulsifying agent and sodium benzoate.

OUR BANQUET, SOUTHERN BELLE, HONEY GOLD and SEA GULL BRANDS OLEOMARGARINE, containing oleo and cottonseed oils, neutral lard, buttermilk, salt and sodium monostearosulfoacetate as emulsifying agent.

SOUTHERN BELLE, MRS. FILBERT'S and NEW HONEY GOLD BRANDS OLEOMARGARINE, containing hydrogenated and winter white cottonseed oils, buttermilk, salt, sodium monostearosulfoacetate as emulsifying agent and sodium benzoate.

Glidden Company, Chicago. *See* Durkee Famous Foods.

John F. Jelke Company, Chicago.

DELICIA BRAND OLEOMARGARINE, containing coconut and cottonseed oils, cultured milk, salt and soy bean lecithin as emulsifying agent.

JELKE'S GOOD LUCK BRAND VEGETABLE OLEOMARGARINE. *See* "Oleomargarine Fortified with Vitamin A."

Swift & Company, Chicago.

ALLSWEET BRAND OLEOMARGARINE, containing oleo and soy bean oils and either peanut or cottonseed oil, neutral lard, cultured skimmed milk, salt and sodium benzoate; or hydrogenated and white cottonseed oils, oleo oil, cultured skimmed milk, salt and sodium benzoate; or hydrogenated and white cottonseed oils, cultured skimmed milk, salt and sodium benzoate.

GEM BRAND OLEOMARGARINE, containing coconut oil, hydrogenated coconut oil, cottonseed or peanut oil and soy bean oil, hydrogenated soy bean oil, cultured milk, salt and sodium benzoate.

The following firms distribute under their own labels oleomargarine products purchased from manufacturers of accepted products now privileged to use the seal of acceptance. The labels and advertising conform to the Rules and Decisions of the Council.

Oakley Brothers, Topeka, Kan.

MAYBELLE BRAND OLEOMARGARINE, containing oleo and cottonseed oils, cultured skimmed milk, salt and sodium benzoate.

MAYBELLE BRAND OLEOMARGARINE, containing cottonseed oil, cultured skimmed milk, salt and sodium benzoate.

OLEOMARGARINE FORTIFIED WITH VITAMIN A

The fortification of oleomargarine with vitamin A, in the considered judgment of the Council, is in the interest of public health. Butter contains vitamin A in amounts that may constitute an important fraction of the daily requirement of vitamin A. The use of oleomargarine lacking vitamin A to the exclusion of butter may result in a significant decrease in the intake of this factor, unless special consideration is given to other sources of vitamin A in the diet.

Oleomargarines fortified with vitamin A are considered for acceptance by the Council when the labels and advertising conform to the Rules and Decisions of the Council and the following information is provided:

1. Source and potency of the vitamin A preparation used in the manufacturing process.

2. Assurance that the firm has made adequate provision for a continuous supply of the vitamin A preparation so that the product is uniformly fortified. Evidence must be provided that adequate control is exercised over the potency of the fish liver oil or other preparation containing vitamin A.

3. Suitable evidence to show that the vitamin A potency of the oleomargarine is controlled. (Some firms determine the vitamin A potency of their product frequently in their own laboratories by spectrophotometric or chemical test.) For the present, the Council also requires that protocols of three biologic assays a year be provided to demonstrate the presence of at least as great a potency of vitamin A as is claimed.

4. Evidence that the vitamin A potency does not decrease during a storage period under average conditions.

5. Statement on the label that the fortified product contains not less than 7,500 U. S. P. units of vitamin A to the pound.

All accepted brands of fortified oleomargarine contain at least 7,500 U. S. P. units of vitamin A to the pound. They also contain some vitamin D, because both vitamins A and D are present in the fish liver oils used in the manufacturing process. The vitamin D thus added to the oleomargarine is declared on the label by the phrase "contains vitamin D." The Council recognizes no claim beyond the statement that some vitamin D may be present in the fortified oleomargarine.

Under an existing ruling of the Bureau of Animal Industry of the United States Department of Agriculture, oleomargarine produced from animal fats under the federal Meat Inspection Act may not be fortified with vitamin A. There are no federal regulations prohibiting the addition of oils containing vitamin A to oleomargarines made from vegetable fats. Therefore, all fortified oleomargarines are made from vegetable oils. It is of interest that in several European countries fortification of oleomargarine with vitamin A is required by law.

The listed products of the following firms stand accepted:

The Best Foods, Inc., New York.

NEW NUCOA BRAND OLEOMARGARINE, containing cottonseed oil and peanut or corn oil, cultured milk, salt, sodium benzoate and soy bean lecithin as emulsifying agent; product is fortified with at least 7,500 U. S. P. units of vitamin A per pound and contains vitamin D.

Durkee Famous Foods, Berkeley, Calif. Division of the Glidden Company, Chicago.

DURKEE'S TROCO BRAND OLEOMARGARINE, containing hydrogenated and liquid cottonseed oils, cultured skimmed milk, sodium chloride, sodium monostearosulfoacetate and vitamin A concentrate from fish liver oil.

Analysis (submitted by manufacturer).—Moisture 15.3%, total solids 84.7%, ash 3.2%, salt (NaCl) 3.1%, fat (ether extract) 80.1%, protein (N × 6.25) 0.6%, lactose (by difference) 0.7%, sodium monostearosulfoacetate 0.15%.

Calories.—7.26 per gram; 206 per ounce.

Vitamins.—Protocols of vitamin assay submitted by the company indicate that the product contains not less than 7,500 international units of vitamin A per pound, derived from fish liver oil.

John F. Jelke Company, Chicago.

JELKE'S GOOD LUCK BRAND VEGETABLE OLEOMARGARINE, containing hydrogenated and white cottonseed oils and cultured skimmed milk; product is fortified with at least 7,500 U. S. P. units of vitamin A per pound and contains vitamin D.

Glidden Company, Chicago. *See* Durkee Famous Foods, Berkeley, Calif.

SECTION III

Fruit Juices Including Tomato Juice

The majority of canned fruit juices, except grape and apple juices (cider), are relatively new products, which have been placed on the market since about 1925. Canned tomato juice, which appears to have been the first of the new juices, was immediately of interest. Hess [1] and his associates had demonstrated that the juice of canned tomatoes is a reliable source of vitamin C in the diets of infants and children.

Although sometimes considered a luxury, fruit juices are valuable foods and have a definite place in the average diet. All fruit juices are palatable and refreshing and because of their high water content provide an agreeable means, especially for the invalid, of taking needed fluids. They also serve as a source of food energy and, with added sugar, eggs, cream, milk, gelatin or other ingredients, form a basis for the preparation of nutritious and palatable beverages and desserts. Certain fruit juices are outstandingly rich in vitamin C and are among the most important sources of this vitamin in the average diet.

The canned fruit juices which now stand accepted by the Council on Foods include apple, apricot, blackberry, cherry, grape, grapefruit, loganberry, orange, peach, pear, pineapple, prune, prune-plum, red raspberry and tomato juices. Of these, grapefruit, orange, lemon, tomato and pineapple juices are recognized as excellent sources of vitamin C. Canned apple, grape and prune juices are known to be deficient or entirely lacking in vitamin C, while information concerning the vitamin C potency of canned apricot, blackberry, cherry, loganberry, peach, pear, prune-plum and red raspberry juices has not been provided. The latter juices are as yet being manufactured in relatively small quantities. The brands which now stand accepted by the Council are packed without sugar and although appropriate for the normal diet are intended primarily for use in a carbohydrate-restricted diet or in other special diets. The labels for these products carry a statement of carbohydrate, protein and fat content. The juices therefore are described and the products that stand accepted are listed in section IX, "Foods for Special Dietetic Purposes." In the present section only apple, grape, grapefruit, orange, pineapple, prune, and tomato juices will be discussed. More specific definitions for some of

---

1. Hess, A. F., and Unger, L. J.: Canned Tomatoes as an Antiscorbutic, Proc. Soc. Exper. Biol. & Med. **16**: 1, 1918; Scurvy: VIII. Factors Affecting the Antiscorbutic Value of Food, Am. J. Dis. Child. **17**: 221 (April) 1919.

the fruit juices have been formulated recently under the authority granted to the Secretary of Agriculture by the Food, Drug and Cosmetic Act.

Definition.—The Food and Drug Administration has defined fruit juices in general as "the unfermented liquid obtained from the first pressing of sound, ripe, fresh fruit or its pulp. . . ." Orange, grape and tomato juices have been individually defined thus: 1. "Orange Juice: The unfermented juice obtained from sound, ripe sweet oranges. It may contain a portion of the pulp." 2. "Grape Juice: The unfermented juice of sound, ripe grapes. It is obtained by a single pressing of the fruit, with or without the aid of heat, and with or without the removal of insoluble matter." 3. "Tomato Juice: The unconcentrated, pasteurized product, consisting of the liquid, with a substantial portion of the pulp, expressed from ripe tomatoes, with or without the application of heat, and with or without the addition of salt." Regarding tomato juice, the Food and Drug Administration has ruled that since there is obviously no need to add water in the preparation of this product, the presence of any amount of added water will be deemed an adulteration, as is the addition of color which results in the concealment of damage or inferiority or both, whether or not it is declared on the label.

Prune juice and apple cider, several brands of which have been accepted by the Council, do not conform in all respects to the government definition of fruit juice. However, they may conveniently be classed as such for the purposes of this discussion. Canned sweet apple cider is essentially pasteurized apple juice which has been filtered to remove solid matter, while bottled prune juice is essentially the water extract of the dried prune.

Manufacture.—Methods of preparation vary slightly for the different fruit juices but consist essentially of grinding or crushing the thoroughly cleaned fruit and separating the juice by pressure. The juice may or may not be strained to remove seeds and coarse particles of pulp, after which it is packed or bottled, sealed and heat processed, usually at pasteurizing temperatures.

In the manufacture of apple cider the apples are washed in acid solution to remove any toxic spray residues, thoroughly rinsed and ground. The pulp is arranged in layers between heavy cotton cloth and wooden racks, and pressure is applied. After this the apple juice is filtered through canvas and infusorial earth. Sparkling (carbonated) apple cider is produced by pumping the freshly pressed juice through a silver-lined dome filled with glass balls under pressure of 30 pounds of carbon dioxide. The citrus juices are extracted from the cleaned and automatically halved fruit by mechanical reamers, the method being similar to that commonly used in the household. Citrus juice is frequently deaerated to aid in conserva-

tion of flavor and of vitamin C. Pineapple juice is sometimes prepared by blending the juice drained from crushed pineapple intended for canning with that pressed from pineapple shredded expressly for the preparation of juice, or it may be obtained from the shredded fruit alone.

In the preparation of grape juice the pulp is heated to extract the desired amount of color from the skins. The freshly extracted juice then must be stored at refrigerating temperatures for several months to allow for the precipitation of cream of tartar (argols).

Tomato juice may be prepared by forcing tomatoes through a cylindric metal sieve similar to that used in the preparation of other sieved vegetables and fruits. Thus a large proportion of pulp is included with the juice proper. To secure a stable mixture of pulp and liquid, which will not separate on standing, the tomato juice is usually passed through a homogenizer in which it is forced through tiny apertures in heavy metal valves under 1,500 or more pounds' pressure per square inch. Thus the particles of pulp are so finely divided that they remain permanently suspended in the liquid. As in the preparation of sieved fruits and vegetables for infant feeding, it is the aim of most manufacturers of canned fruit juices to keep the destruction of vitamin C as low as possible; this is aided by performing the operations in a closed system in which air is excluded by means of steam or by high vacuum.

For the preparation of prune juice, which has been described as the water extract of the dried prune, the washed prunes are simmered for two and one-half hours in twice their weight of water, which is then drawn off. The drained prunes are boiled for fifteen minutes in a second bath of water. The prunes are removed, pressed in a cider press and the resulting pulp is boiled in water, removed and again pressed. The expressed fluids are blended with the various water extracts and the whole is standardized to a definite sugar content by the addition of water or prune extract concentrate.

Chemical Composition.—According to analyses submitted by the manufacturers, the Council-accepted brands of the fruit juices described in this section, i. e., apple, grape, grapefruit, orange, pineapple, prune and tomato juice, exhibit the following range of chemical composition: moisture 78.9 to 95.2 per cent, total solids 4.8 to 21.1 per cent, ash (other than sodium chloride added in certain brands of tomato juice) 0.2 to 1.4 per cent, protein (N × 6.25) 0.1 to 1.4 per cent, fat (ether extract) 0.01 to 1.0 per cent, reducing sugar as invert sugar 1.6 to 18 per cent, sucrose 0.05 to 6.7 per cent, total carbohydrate other than crude fiber (by difference) 2.0 to 19.6 per cent, titratable acidity 0.2 to 6.9 per cent, and calories per avoirdupois ounce 3 to 23. The range of values for individual juices will be found in table 1. It will be noted that the chemi-

TABLE 1.—*Composition of Canned Fruit Juices (Submitted by Manufacturers)* *

Product	Number of Analyses	Moisture, %	Total Solids, %	Ash, %	Fat,§ %	Protein,‖ %	Crude Fiber, %	Reducing Sugars,¶ %	Sucrose, %	Carbohydrates,** %	Titratable Acidity,†† %	Calculated Excess Alkalinity,‖‖	Calories per 100 Gm.
Apple cider..........	1	82.3	17.7	0.3	0.0	0.1	...	11.9#	2.3	16.9	0.4‡‡	37.0	70
Grape juice..........	2	78.9-82.2	17.8-21.1	0.3-0.4	0.0-1.0	0.2-0.3	...	16.9-18.0#	0.0	16.9-19.6	0.7-0.8§§	19.4	80
Grapefruit juice†....	8	83.7-92.2	10.3-16.3	0.2-0.5	0.1-0.4	0.4-0.7	0.0-0.3	5.8-9.1	0.2-4.4	8.9-13.4	0.8-1.7	40.8	33-60
Lemon juice‡........	4	89.7-91.4	8.6-10.3	0.2-0.4	0.1-0.6	0.4-0.5	0.0-0.1	1.6-1.9	0.1-0.4	2.0-2.6	5.8-6.9	45.5	10-16
Orange juice†........	11	83.1-87.4	12.6-16.9	0.4-0.8	0.1-0.5	0.4-1.4	0.0-0.4	5.1-10.9	3.0-6.7	10.0-14.7	0.8-1.4	57.0	50-70
Pineapple juice‡.....	3	84.1-85.3	14.7-15.9	0.4	0.0-0.3	0.3-0.4	0.0	9.3-12.8	3.8	12.8-14.3	0.8-0.9	72.0	60
Prune juice..........	1	82.7	17.3	0.3	0.0	0.4	0.0	12.0	0.6	16.4	0.2‡‡	....	70
Tomato juice........	30	91.7-95.2	4.8-8.3	0.5-1.4	0.0-0.7	0.6-1.3	0.0-0.4	1.2-4.1	...	2.6-5.8	0.4-0.6	71.9	14-30

† Sweetened and unsweetened.
‡ Unsweetened.
§ Ether extract.
‖ N × 6.25.
¶ As invert sugar.
# As dextrose.
** Other than crude fiber (by difference).
†† As citric acid.
‡‡ As malic acid.
§§ As tartaric acid.
‖‖ Of ash, cc. 0.1 N alkali per 10 Gm. juice.

* Some figures for minerals on which calculations were based were obtained from average tables (Sherman, H.: Chemistry of Food and Nutrition, ed. 4, New York, The Macmillan Company, 1932).

cal constituent which is present in largest amounts is water. Lemon and tomato juices are highest in water and contain the smallest amount of total solids, while grape juice, prune juice and apple cider are lowest in water and highest in total solids. It will be observed that differences in total solids are largely accounted for by differences in carbohydrate content.

The predominating sugars are those which occur naturally in the fresh fruit, i. e., the monosaccharide dextrose, sometimes called grape sugar, and levulose, also known as fructose or fruit sugar. The small amount of sucrose present is sometimes a natural constituent of the fresh juice but more often is added for sweetening purposes.

Since protein and fat combined are usually present in amounts of not more than approximately 1 per cent, it is apparent that the caloric value of the different juices is derived chiefly from carbohydrate. Lemon juice, which contains the smallest amount of carbohydrate, i. e. from 2.0 to 2.6 per cent, provides only 10 to 16 calories per hundred grams. Grape juice, which contains from 16.9 to 19.6 per cent of total carbohydrate, provides an average of 80 calories per hundred grams.

From information available in the scientific literature, supplemented by reports of complete mineral analysis submitted by certain manufacturers, it is estimated that this group of accepted fruit juices contains a maximum of approximately 0.024 per cent calcium, 0.020 per cent phosphorus and 0.003 per cent iron. The iron content of the majority of these juices ranges from approximately 0.0002 to 0.0005 per cent. These amounts of calcium, phosphorus and iron are of little nutritional significance. Prune juice, however, which contains 0.003 per cent, or 3 milligrams, of iron per hundred grams of juice, is an excellent source of food iron. Orange and tomato juices, with approximately 0.0008 per cent each, may also furnish significant amounts.

These fruit juices, except prune juice, have been estimated to provide an excess of alkali-forming over acid-forming elements equivalent to approximately 20 to 72 cc. of tenth-normal alkali for each 10 grams of juice. Prune juice has been omitted from these calculations because it is well known that prunes contain a somewhat unusual acid, benzoic, which gives rise to hippuric acid in metabolism. Because the body has no power to oxidize the latter acid, it is excreted in the urine and probably carries with it much of the fixed alkali furnished by the prunes.

Vitamin Content.—Average figures available in the literature indicate that canned tomato juice may be expected to contain approximately 850 U. S. P. units of vitamin A, 15 international units of vitamin B_1 and 20 Sherman-Bourquin units of vitamin G per hundred grams. Canned pineapple juice is reported to contain an average of from 100 to 150 U. S. P.

units of vitamin A, 35 international units of vitamin B_1 and 10 Sherman-Bourquin units of vitamin G; canned grapefruit juice, no vitamin A, 10 international units of vitamin B_1 and 40 Sherman-Bourquin units of vitamin G; canned orange juice, 100 U. S. P. units of vitamin A, 30 to 40 international units of vitamin B_1 and 35 Sherman-Bourquin units of vitamin G. The vitamin A, B_1 (thiamin) and G (riboflavin) content of the other canned fruit juices considered in this section is either negligible or not reported in the scientific literature.

Antiscorbutic Potency.—The importance of many fresh fruit juices as sources of vitamin C is widely recognized. At the present time fresh orange juice is commonly used as a routine source of vitamin C in the feeding of infants. The question has frequently been raised whether canned orange juice or other canned fruit juices also could be used, because vitamin C is readily destroyed by oxidation, particularly on heating. Commercially canned fruit juices and tomato juice have been shown to contain appreciable quantities of vitamin C when precautions have been taken to prevent the destruction of the vitamin during the canning process. In general, the conservation of the vitamin is accomplished by raising the temperature of the juice rapidly, in order to drive out dissolved air and to destroy the "oxidase" which catalytically destroys vitamin C, and by performing the canning operations under reduced pressure or in an atmosphere of steam.

In the fall of 1937 a complete survey of the vitamin C content of the accepted brands of canned orange, lemon, grapefruit, pineapple and tomato juices was made. The ascorbic acid content was determined by means of titration with 2,6-dichlorophenolindophenol, according to the method of Bessey and King.[2] This method has been reported to give results which are a satisfactory index of the actual vitamin C content. Apple cider, grape juice and prune juice were omitted from the survey because available experimental data indicate that these juices are not important sources of vitamin C.

There were examined in all eight brands of canned orange juice, three brands of canned lemon juice, eight brands of canned grapefruit juice, three brands of canned pineapple juice and seventeen brands of canned tomato juice. A much larger number of brands of these products stand accepted by the Council, but many of these represent private label brands of accepted products. The survey, therefore, covers all products of this type which on Sept. 1, 1937, were privileged to display the Seal of Acceptance of the Council on Foods.

The figures show that all brands of the canned fruit juices examined contained appreciable quantities of vitamin C. The

2. Bessey, O. A., and King, C. G.: The Distribution of Vitamin C in Plant and Animal Tissues and Its Determination, J. Biol. Chem. 103: 687 (Dec.) 1933.

eight different brands of canned orange juice contained from 0.31 to 0.56 mg. of vitamin C per cubic centimeter. The average was 0.44 and the median 0.43 mg. per cubic centimeter. Three samples of canned lemon juice contained from 0.41 to 0.58 mg. of vitamin C per cubic centimeter; the average was 0.52 mg. per cubic centimeter. The eight brands of canned grapefruit juice examined contained from 0.29 to 0.42 mg. of vitamin C per cubic centimeter, with an average value of 0.37 and a median of 0.40 mg. per cubic centimeter. Three brands of canned pineapple juice contained from 0.10 to 0.18 mg. per cubic centimeter, with an average of 0.14 mg. Seventeen samples of canned tomato juice contained from 0.13 to 0.29 mg. of vitamin C per gram. The average value was 0.20 mg. per gram, and the median was the same. In terms of the average approximate number of international units of vitamin C per hundred cubic centimeters, pineapple juice contains 300, tomato juice 400, grapefruit juice 750, orange juice 900 and lemon juice 1,000.

There are many factors which affect the vitamin C concentration of fruit juices. The vitamin C content of fresh fruits may be expected to vary according to the variety of the fruit, the conditions under which the crop has been grown, the degree of ripeness and other factors. After the juice has been expressed from the fruit, its vitamin C potency decreases on standing. Canned juices are subject to the additional possibility of the loss of some vitamin C during the canning process. There probably is some loss of vitamin C of canned juices even when they remain in unopened cans. It has been shown that there is a gradual loss of vitamin C in canned tomato juice which has been allowed to stand in the refrigerator for twenty-four hours or longer after the can has been opened.

However, fresh orange juice loses very little vitamin C potency on standing in the refrigerator, especially if protected from air. On the other hand, solutions prepared from crystalline ascorbic acid may lose considerable vitamin C potency on standing in the refrigerator.[2a]

Nutritional Significance.—The vitamin C requirements of man vary with circumstances. It has been estimated[3] that from 100 to 200 international units of vitamin C per day will protect an infant from scurvy and that from 800 to 1,000 international units is the usual intake of the breast-fed normal infant, or of the bottle-fed baby receiving the customary quantities of orange juice. Everson and Daniels[4] have suggested that from 2,000

2a. The Loss of Vitamin C in Orange Juice on Standing. A Report of the Council on Foods, J. A. M. A. **112**: 2420 (June 10) 1939.

3. Cowgill, G. R.: The Vitamin Requirements of Man, J. Am. Dietet. A. **13**: 195 (Sept.) 1937.

4. Everson, Gladys J., and Daniels, Amy L.: Vitamin C Studies with Children of Preschool Age, J. Nutrition **12**: 15 (July) 1936.

to 3,000 international units of vitamin C a day is necessary in order to attain maximum retention of vitamin C in children of preschool age. This may be an index of the optimal requirements, but further work will be necessary before the minimum and optimal requirements are more thoroughly established. It has been estimated that 300 international units of vitamin C is an amount which will prevent scurvy in an adult. Larger quantities are considered desirable for normal nutrition. Rose [5] has suggested that a person taking 3,000 calories a day also should have at least 600 international units of vitamin C. Some workers [6] have stated that a desirable vitamin C intake for adults would be in the neighborhood of 1,000 international units. Computations of the probable vitamin C intake from uncooked foods used in ordinary "good" diets show that 1,000 international units is more likely to be the actual intake.

If it is considered that about 1,000 international units of vitamin C (or 50 mg. of ascorbic acid) is a desirable allowance for adults, it readily can be computed that the entire vitamin C requirement could be satisfied by the consumption of about 350 cc. of canned pineapple juice, 250 cc. of canned tomato juice, 125 cc. of canned grapefruit juice, 110 cc. of canned orange juice or 100 cc. of canned lemon juice. Except for the lemon juice, which is used largely as a flavoring material, it would easily be possible for amounts of these fruit juices to be taken that would cover all, or nearly all, of the average adult requirements for vitamin C. This, of course, is not essential because there are other foods in the ordinary diet which also provide this vitamin. The point is emphasized by such figures, however, that all the fruit juices under consideration are excellent sources of vitamin C. Canned orange juice is a little more than twice as potent in vitamin C as canned tomato juice. Canned grapefruit juice has a vitamin C potency only slightly less than that of canned orange juice. Canned pineapple juice is about one-third as potent in vitamin C as canned orange juice.

It has long been customary to consider the desirable intakes of vitamin C for infants in terms of fresh orange juice. The vitamin C content of fresh orange juice has been found to vary from about 0.40 to 0.60 or more mg. per cubic centimeter.[7] The question sometimes is asked, How much canned

5. Rose, Mary S.: A Laboratory Handbook for Dietetics, ed. 4, New York, The Macmillan Company, 1937, p. 25.

6. von Eeckelen, Marie: On the Amount of Ascorbic Acid in Blood and Urine: The Daily Human Requirements for Ascorbic Acid, Biochem. J. **30**: 2291 (Dec.) 1936. Heinemann, Martin: On the Relation Between Diet and Urinary Output of Thiosulfate and Ascorbic Acid: II. Human Requirements for Vitamin C, ibid. **30**: 2299 (Dec.) 1936

7. Daniel, Esther P., and Rutherford, Marjorie B.: Ascorbic Acid Content of a Number of Citrus Fruits, J. Agric. Research **54**: 689 (May) 1937.

orange juice or canned tomato juice should be substituted for fresh orange juice? From the figures available, it would appear that canned orange juice is only slightly less potent in vitamin C than the fresh juice from which it is made. Approximately two and one-half volumes of canned tomato juice should be given in order to provide the vitamin C equivalent of one volume of fresh orange juice. If other juices are to be substituted, it is probable that the substitution could be made, other things being equal, on the basis of the vitamin C content. In large clinics where suitable laboratory facilities are available the ascorbic acid content of products under consideration could readily be estimated by chemical titration.

Several of the fruit juices, particularly canned orange and pineapple juices, furnish significant amounts of vitamin B_1. Tomato juice alone of this group of juices contains important amounts of vitamin A. Prune juice is distinguished from other fruit juices because it lacks vitamin C but is rich in iron and also has a recognized laxative effect. An important component of the fruit juices is their water content; by drinking fruit juices which are agreeable and refreshing, a sick person and indeed a well person, can be induced to take larger amounts of fluid. The carbohydrate content must, of course, be taken into consideration, especially in the reducing diet and in the diet for a patient with diabetes. Fruit juices are proper in these diets only if their carbohydrate content is taken into account.

The ability of a fruit juice to aid in maintaining the normal alkali reserve depends on at least two factors: the excess of alkali-forming over acid-forming elements in the ash and the character of the organic acid radicals present in the juice. The acid-forming properties of prune juice have already been discussed. Of the other fruit juices under consideration orange, pineapple and tomato juices provide an especially large excess of alkali-forming minerals and may be expected to be of assistance in producing alkaline urine and in maintaining normal alkaline reserve. It should be remembered, however, that the usual well balanced diet includes many alkali-yielding foods: milk in its various forms, fruits and vegetables. Acid-forming diets, therefore, are not a practical nutritional problem because a good modern mixed diet adequate in minerals and vitamins cannot be potentially acid.

Summary.—Canned orange, grapefruit, lemon, pineapple and tomato juices are excellent sources of vitamin C. Except for prune juice, which is an excellent source of iron, the fruit juices in general contain insignificant amounts of minerals. Fruit juices, except prune juice, produce a potentially alkaline residue, but this characteristic is not of practical importance because a modern mixed diet adequate in minerals and vitamins cannot be potentially acid. Fruit juices are refresh-

ing and provide an agreeable means, especially for the invalid, of taking needed fluids. The carbohydrate content of fruit juices must be taken into consideration, particularly in reducing diets and in diets for patients with diabetes.

APPLE CIDER

The listed products of the following firms stand accepted:

S. Martinelli and Company, Watsonville, Calif.

MARTINELLI'S GOLD MEDAL BRAND SWEET APPLE CIDER, a pasteurized sweet apple juice.

Analysis (submitted by manufacturer).—Moisture 82.3%, total solids 17.7%, ash 0.3%, fat none, protein (N × 6.25) 0.1%, reducing sugars as dextrose 11.9%, sucrose 2.3%, carbohydrates (by difference) 16.9%, titratable acidity as malic acid 0.4%, arsenic (As_2O_3) 0.034 to 0.040 mg. per hundred grams.

Calories.—0.7 per gram; 20 per ounce.

MARTINELLI'S GOLD MEDAL BRAND CHAMPAGNE TYPE SPARKLING APPLE CIDER (CARBONATED), a carbonated pasteurized sweet apple cider.

Analysis and Calories.—See S. Martinelli's Gold Medal Brand Sweet Apple Cider.

GRAPE JUICE

The listed products of the following firms stand accepted:

Church Grape Juice Company, Kennewick, Wash.

CHURCH'S BRAND CONCORD GRAPE JUICE, a bottled pasteurized Concord grape juice.

Analysis (submitted by manufacturer).—Moisture 82.2%, total solids 17.8%, ash 0.3%, fat 1.0%, protein (N × 6.25) 0.2%, reducing sugars as invert sugar 16.9%, sucrose none, carbohydrates (by difference) 16.9%, titratable acidity as tartaric acid 0.7%.

Calories.—0.8 per gram; 23 per ounce.

S. Martinelli and Company, Watsonville, Calif.

MARTINELLI'S GOLD MEDAL BRAND CONCORD GRAPE JUICE, a bottled pasteurized Concord grape juice to which sugar is added when necessary to maintain a uniform sugar content.

Analysis (submitted by manufacturer).—Moisture 78.9%, total solids 21.1%, ash 0.4%, fat trace, protein (N × 6.25) 0.3%, reducing sugars as dextrose 18.0%, sucrose none, titratable acidity as tartaric acid 0.8%, carbohydrates (by difference) 19.6%.

Calories.—0.8 per gram; 23 per ounce.

The following firms distribute under their own labels grape juice products purchased from manufacturers of accepted products now privileged to use the Seal of Acceptance. The labels and advertising conform to the Rules and Decisions of the Council.

Haas, Baruch & Co., Los Angeles.

IRIS BRAND GRAPE JUICE.

The Morey Mercantile Company, Denver.

SOLITAIRE BRAND GRAPE JUICE.

GRAPEFRUIT JUICE

The listed products of the following firms stand accepted:

Ariz-Sweet Packing Corporation, Peoria, Ariz.

ARIZ-SWEET BRAND GRAPEFRUIT JUICE SWEETENED.
ARIZ-SWEET BRAND GRAPEFRUIT JUICE UNSWEETENED.
GOLD-PAK BRAND GRAPEFRUIT JUICE SWEETENED.
GOLD-PAK BRAND GRAPEFRUIT JUICE UNSWEETENED.

Bruce's Juices, Inc., Tampa, Fla.

BRUCE'S JUICES BRAND GRAPEFRUIT SWEETENED.
BRUCE'S JUICES BRAND GRAPEFRUIT JUICE UNSWEETENED.
FLORANDA BRAND GRAPEFRUIT JUICE SWEETENED.
FLORANDA BRAND GRAPEFRUIT JUICE UNSWEETENED.
KINGSWAY BRAND GRAPEFRUIT JUICE SWEETENED.
KINGSWAY BRAND GRAPEFRUIT JUICE UNSWEETENED.

The Hills Brothers Company, New York.

DROMEDARY BRAND GRAPEFRUIT JUICE SWEETENED.
DROMEDARY BRAND GRAPEFRUIT JUICE UNSWEETENED.

Dr. P. Phillips Company, Orlando, Fla.

COMMANDER and DR. P. PHILLIPS BRANDS FLORIDA GRAPEFRUIT JUICE SWEETENED.

Rio Grande Valley Citrus Exchange, Weslaco, Texas.

TEXSUN BRAND GRAPEFRUIT JUICE SWEETENED.
TEXSUN BRAND GRAPEFRUIT JUICE UNSWEETENED.

Tyrrell and Garth, Houston, Texas.

GARTH BRAND TEXAS GRAPEFRUIT JUICE SWEETENED.
GARTH BRAND TEXAS GRAPEFRUIT JUICE UNSWEETENED.

The following firms distribute under their own labels grapefruit juice products purchased from manufacturers of accepted products now privileged to use the Seal of Acceptance. The labels and advertising conform to the Rules and Decisions of the Council.

Chas. W. Bauermeister Company, Terre Haute, Ind.

GOOD MORNING BRAND FLORIDA GRAPEFRUIT JUICE.
GOOD MORNING BRAND GRAPEFRUIT JUICE UNSWEETENED.

Grosberg-Golub Company, Inc., Schenectady, N. Y. *See* Sweet Life Food Corporation, Brooklyn.

Hale-Halsell Company, McAlester, Okla.

HALE'S PRIDE BRAND GRAPEFRUIT JUICE.

E. Lichenstein Company, Atlanta, Ga.

GAINSBOROUGH BRAND GRAPEFRUIT JUICE SWEETENED.

J & M Steiner, Inc., Milwaukee.

RED RIBBON BRAND FLORIDA GRAPEFRUIT JUICE.

Tree-Fresh Citrus Co., Phoenix, Ariz.

TREE-FRESH BRAND GRAPEFRUIT JUICE.

Sweet Life Food Corporation, Brooklyn, product distributed by Grosberg-Golub Company, Inc., Schenectady, N. Y.

SWEET LIFE BRAND GRAPEFRUIT JUICE SWEETENED.
SWEET LIFE BRAND GRAPEFRUIT JUICE UNSWEETENED.

LEMON JUICE

The listed products of the following firms stand accepted:

Fruit Products of America, Arcadia, Calif.
HULBURT'S BRAND CALIFORNIA LEMON JUICE.

Natural Food Products Company, Orange, Calif.
STEPHENS BRAND LEMON JUICE.

Santa Barbara Citrus Juice Co., Inc., Orange, Calif.
VALORA BRAND CALIFORNIA LEMON JUICE.

Treesweet Products Company, Los Angeles.
TREESWEET BRAND CALIFORNIA LEMON JUICE.

The following firm distributes under its own labels lemon juice purchased from manufacturers of accepted products now privileged to use the Seal of Acceptance. The labels and advertising conform to the Rules and Decisions of the Council.

Phillips-Lewis Company, Inc., Richmond, Va.
HOME SPUN BRAND LEMON JUICE

ORANGE JUICE

The listed products of the following firms stand accepted:

Absopure Fruit Products, Inc., Anaheim, Calif.
ABSOPURE BRAND CALIFORNIA ORANGE JUICE.

Bireley's, Hollywood, Calif.
GOLDEN BEAR BRAND CALIFORNIA ORANGE JUICE SWEETENED.

Bruce's Juices, Inc., Tampa, Fla.
BRUCE'S JUICES BRAND ORANGE JUICE SWEETENED.
BRUCE'S JUICES BRAND ORANGE JUICE UNSWEETENED.
FLORANDA BRAND ORANGE JUICE SWEETENED.
FLORANDA BRAND ORANGE JUICE UNSWEETENED.
KINGSWAY BRAND ORANGE JUICE SWEETENED.
KINGSWAY BRAND ORANGE JUICE UNSWEETENED.

Fruit Products of America, Arcadia, Calif.
HULBURT'S BRAND CALIFORNIA ORANGE JUICE SWEETENED.

The Hills Brothers Company, New York.
DROMEDARY BRAND ORANGE JUICE SWEETENED.

Libby, McNeill & Libby, Chicago.
LIBBY'S BRAND CALIFORNIA ORANGE JUICE.

Natural Food Products Company, Orange, Calif.
STEPHENS BRAND ORANGE JUICE.

Dr. P. Phillips Company, Orlando, Fla.
COMMANDER BRAND FLORIDA ORANGE JUICE.
DR. P. PHILLIPS BRAND FLORIDA ORANGE JUICE SWEETENED.

Santa Barbara Citrus Juice Co., Inc., Orange, Calif.
VALORA BRAND VALENCIA ORANGE JUICE.

Treesweet Products Company, Los Angeles.
TREESWEET BRAND CALIFORNIA ORANGE JUICE.

The following firms distribute under their own labels orange juice purchased from manufacturers of accepted products now privileged to use the Seal of Acceptance. The labels and advertising conform to the Rules and Decisions of the Council.

Chas. W. Bauermeister Company, Terre Haute, Ind.
GOOD MORNING BRAND ORANGE JUICE.

Delray Corporation, San Francisco.
DEL RAY BRAND CALIFORNIA ORANGE JUICE.

General Grocer Company, St. Louis.
TOPMOST and AMERICAN LADY BRANDS ORANGE JUICE

Grosberg-Golub Company, Inc., Schenectady, N. Y. *See* Sweet Life Food Corporation, Brooklyn.

Haas, Baruch & Co., Los Angeles.
IRIS BRAND ORANGE JUICE.

Hale-Halsell Company, McAlester, Okla.
HALE'S PRIDE BRAND ORANGE JUICE.

Jacobson-Shealy Co., Inc., San Francisco.
SUN-BLEST BRAND ORANGE JUICE.

Kansas City Wholesale Grocery Co., Kansas City, Mo.
PICKWICK BRAND ORANGE JUICE.

Garland C. Norris, Inc., Raleigh, N. C.
FLORIDA and GOLDEN TAP BRANDS ORANGE JUICE.

John Sexton & Company, Chicago and Brooklyn.
EDELWEISS BRAND CALIFORNIA ORANGE JUICE.

Sun-Gold Orange Juice Co., Detroit.
FLORIDA BRAND ORANGE JUICE.

Sweet Life Food Corporation, Brooklyn, product distributed by Grosberg-Golub Company, Inc., Schenectady, N. Y.
SWEET LIFE BRAND ORANGE JUICE SWEETENED.

ORANGE-GRAPEFRUIT JUICE

The listed products of the following firms stand accepted:

Bruce's Juices Inc., Tampa, Fla.
BRUCE'S JUICES BRAND ORANGE AND GRAPEFRUIT JUICE SWEETENED.
KINGSWAY BRAND ORANGE AND GRAPEFRUIT JUICE SWEETENED.

The Hills Brothers Company, New York.
DROMEDARY BRAND FLORIDA ORANGE-GRAPEFRUIT JUICE SWEETENED, a blend of the Accepted Dromedary Sweetened Grapefruit Juice and Dromedary Orange Juice.

Dr. P. Phillips Company, Orlando, Fla.
DR. P. PHILLIPS BRAND FLORIDA GRAPEFRUIT and ORANGE JUICE SWEETENED, a blend of the accepted Dr. P. Phillips Florida Sweetened Orange Juice and Dr. P. Phillips Florida Sweetened Grapefruit Juice.

Rio Grande Valley Citrus Exchange, Weslaco, Texas.
TEXSUN BRAND GRAPEFRUIT AND ORANGE JUICE SWEETENED.

PINEAPPLE JUICE

The listed products of the following firms stand accepted:

Alexander & Baldwin, Ltd., Honolulu, Hawaii, product packed by subsidiaries Kauai Pineapple Company, Kalaheo, Kauai; Baldwin Packers, Ltd., Lahaina, Maui, and the Maui Pineapple Company, Kahului, Maui.

GREETINGS BRAND PINEAPPLE JUICE.

Hawaiian Pineapple Company, Ltd., San Francisco.

DIAMOND HEAD, DOLE, HONEY DEW, PARADISE ISLAND and SWEET TREAT BRANDS DOLE HAWAIIAN PINEAPPLE JUICE

Libby, McNeill & Libby, Chicago.

LIBBY'S BRAND HAWAIIAN PINEAPPLE JUICE

The following firms distribute under their own labels pineapple juice products purchased from manufacturers of accepted products now priviledged to use the Seal of Acceptance. The labels and advertising conform to the Rules and Decisions of the Council.

Aunt Nellie's Farm Kitchen, Inc., Hartford, Wis.

AUNT NELLIE'S BRAND HAWAIIAN PINEAPPLE JUICE.

Austin Nichols & Company, Inc., New York.

SUNBEAM BRAND HAWAIIAN PINEAPPLE JUICE.

Chas. W. Bauermeister, Terre Haute, Ind., product distributed by Good Morning Co-Operators, Terre Haute, Ind.

GOOD MORNING BRAND HAWAIIAN PINEAPPLE JUICE.

Boswell Grocery Company, Kilgore, Texas.

BOSWELL'S BRAND HAWAIIAN PINEAPPLE JUICE.

Campbell Holton Company, Bloomington, Ill.

HAPPY HOUR BRAND HAWAIIAN PINEAPPLE JUICE

M. J. Caplan Co., Inc., Lawrence, Mass.

RADIO BRAND HAWAIIAN PINEAPPLE JUICE.

Cressey, Dockham & Co., Inc., Salem, Mass.

LESLIE BRAND HAWAIIAN PINEAPPLE JUICE.

The W. H. Dunne Company, Norwich, N. Y.

SUPREME COURT BRAND HAWAIIAN PINEAPPLE JUICE.

Durand-McNeil-Horner Company, Chicago.

NONE-SUCH BRAND HAWAIIAN PINEAPPLE JUICE.

Economy Grocery Stores Corporation, Boston.

ECCO BRAND HAWAIIAN PINEAPPLE JUICE.

Embassy Grocery Corporation, New York.

LUCKY BOY BRAND HAWAIIAN PINEAPPLE JUICE.

George D. Emerson Co., Boston.

OLD GOLD BRAND HAWAIIAN PINEAPPLE JUICE.

Fall River Economy Wholesale Grocery Co., Inc., Fall River, Mass.
MOUNT HOPE BRAND PINEAPPLE JUICE.

The E. H. Frechtling Company, Hamilton, Ohio.
FORT HAMILTON BRAND PINEAPPLE JUICE.

General Grocer Company, St. Louis.
AMERICAN LADY and TOPMOST BRANDS HAWAIIAN PINEAPPLE JUICE.

Goldfine & Brenner, Inc., Philadelphia.
G & B BRAND PINEAPPLE JUICE.

Good Morning Co-Operators, Terre Haute, Ind. *See* Charles W. Bauermeister, Terre Haute, Ind

Greenspan Brothers Company, Perth Amboy, N. J.
FLAGSTAFF BRAND HAWAIIAN PINEAPPLE JUICE.

Harrisburg Grocery Company, Harrisburg, Pa.
AUNT NELLIE'S BRAND HAWAIIAN PINEAPPLE JUICE

Haserot Company, Cleveland.
"DRINK ME" WONDERLAND, HASEROT'S LIQUID SUNSHINE and PONO BRANDS HAWAIIAN PINEAPPLE JUICE.

Holmes-Swift Company, Augusta, Maine.
FORT WESTERN BRAND HAWAIIAN PINEAPPLE JUICE.

G. E. Howard & Company, Newburgh, N. Y.
SNOWBALL BRAND HAWAIIAN PINEAPPLE JUICE

Jacobson-Shealy Co., Inc., San Francisco.
SUN-BLEST BRAND HAWAIIAN PINEAPPLE JUICE.

H. A. Johnson Company, Boston and New York.
JOHNSON'S BESTOVALL BRAND HAWAIIAN PINEAPPLE JUICE.

Keystone Wholesale Grocery Company, Reading, Pa.
KEYCO BRAND PINEAPPLE JUICE.

M. I. Kimball Co., Inc., Lawrence, Mass.
MILTON BRAND PINEAPPLE JUICE.

Lefkowitz-Elias Company, New Brunswick, N. J.
COLLEGE TOWN BRAND HAWAIIAN PINEAPPLE JUICE.

Lehmann Higginson Grocer Company, Wichita, Kan.
LEHMANN'S BRAND HAWAIIAN PINEAPPLE JUICE.

Loeb Dietetic Food Company, New York.
LOEB'S BRAND HAWAIIAN PINEAPPLE JUICE.

H. A. Marr Grocery Company, Denver.
MARCO BRAND PINEAPPLE JUICE.

The Morey Mercantile Company, Denver.
SOLITAIRE BRAND HAWAIIAN PINEAPPLE JUICE.

North Hudson Grocery Co., North Bergen, N. J.
YANKEE BRAND HAWAIIAN PINEAPPLE JUICE.

Phillips-Lewis Company, Inc., Richmond, Va.
HOMESPUN BRAND HAWAIIAN PINEAPPLE JUICE

Prospect Supply Company, Yonkers, N. Y.
NEW LIBERTY BRAND HAWAIIAN PINEAPPLE JUICE

The Ranney-Davis Mercantile Co., Arkansas City and Wichita, Kan.
RANNEY'S BRAND HAWAIIAN PINEAPPLE JUICE.

Red & White Corporation, San Francisco.
RED & WHITE BRAND HAWAIIAN PINEAPPLE JUICE.

Rhode Island Wholesale Grocery Company, Providence, R. I.
WHAT CHEER BRAND HAWAIIAN PINEAPPLE JUICE.

Rival Foods, Inc., Cambridge, Mass.
RIVAL BRAND HAWAIIAN PINEAPPLE JUICE.

Roundy, Peckham & Dexter Company, Milwaukee.
ROUNDY'S SUPREME BRAND HAWAIIAN PINEAPPLE JUICE.

R. Schayowitz & Sons, Detroit.
GROSSE POINTE BRAND HAWAIIAN PINEAPPLE JUICE.

John Sexton & Company, Chicago and Brooklyn.
EDELWEISS BRAND HAWAIIAN PINEAPPLE JUICE.

Steele-Wedeles Company, Chicago.
SAVOY BRAND HAWAIIAN PINEAPPLE JUICE.

Twin City Wholesale Grocer Company, St. Paul, Minneapolis, and Fargo, N. D.
FAIRWAY WHITE LABEL BRAND HAWAIIAN PINEAPPLE JUICE.

Twin Ports Wholesale Grocer Co., Duluth, Minn., and Superior, Wis.
FAIRWAY WHITE LABEL BRAND HAWAIIAN PINEAPPLE JUICE.

United Fruit Stores, Inc., Providence, R. I.
BONNIE BRAND HAWAIIAN PINEAPPLE JUICE.

United Grocers Company, Brooklyn.
UNITED BRAND HAWAIIAN PINEAPPLE JUICE.

Waples Platter Company, Fort Worth, Texas.
WHITE SWAN BRAND PINEAPPLE JUICE.

The Weideman Co., Cleveland.
WEIDEMAN BOY BRAND HAWAIIAN PINEAPPLE JUICE.

White Villa Grocers, Inc., Cincinnati and Dayton, Ohio.
WHITE VILLA BRAND HAWAIIAN PINEAPPLE JUICE.

The Winfield Wholesale Grocery Company, Wichita and Winfield, Kan.
WINFIELD SUPREME BRAND HAWAIIAN PINEAPPLE JUICE.

Wood County Grocery Co., Inc., Wisconsin Rapids, Wis.
FAIRWAY WHITE LABEL BRAND HAWAIIAN PINEAPPLE JUICE.

The Yantic Grain & Products Co., Norwich, Conn.
THAMES VALLEY BRAND HAWAIIAN PINEAPPLE JUICE

PRUNE JUICE

The listed product of the following firm stands accepted:

California Prune and Apricot Growers Association, San Jose, Calif.

SUNSWEET BRAND JUICE of the DRIED PRUNE, a bottled pasteurized water extract of dried prunes.

Analysis (submitted by manufacturer).—Moisture 82.7%, total solids 17.3%, ash 0.3%, fat 0.02%, protein (N × 6.25) 0.4%, reducing sugars as invert sugar 12.0%, sucrose 0.6%, crude fiber none, carbohydrates (by difference) 16.4%, titratable acidity as malic acid 0.2%, aluminum (Al) 1 mg. per hundred grams, calcium (Ca) 10 mg. per hundred grams, chlorine (Cl) 3 mg. per hundred grams, copper (Cu) 0.3 mg. per hundred grams, iron (Fe) 3 mg. per hundred grams, magnesium (Mg) 10 mg. per hundred grams, manganese (Mn) 0.05 mg. per hundred grams, phosphorus (P) 20 mg. per hundred grams, potassium (K) 0.17%, silicon (Si) 2 mg. per hundred grams, sodium (Na) 10 mg per hundred grams, sulfur (S) 8 mg. per hundred grams.

Calories.—0.7 per gram; 20 per ounce.

TOMATO JUICE

The listed products of the following firms stand accepted.

American Packing Corporation, Evansville, Ind. *See* The Loudon Packing Company, Terre Haute, Ind.

Beech-Nut Packing Company, Canajoharie, N. Y.

BEECH-NUT BRAND TOMATO JUICE.

California Conserving Company, Inc., San Francisco.

CALIFORNIA HOME BRAND TOMATO JUICE.

W. N. Clark Company, Rochester, N. Y.

CLARKO and W. N. CLARK BRANDS TOMATO JUICE.

College Inn Food Products Company, Chicago.

COLLEGE INN BRAND Tomato Juice.

Comstock Canning Corporation, Newark, N. Y.

SECCO, PRIDE OF EGYPT, SUNSHINE, SWEET VIOLET DEFENDER BRANDS TOMATO JUICE.

The Crosse & Blackwell Company, Baltimore.

CROSSE & BLACKWELL BRAND TOMATO JUICE.

Curtice Brothers Company, Inc., Rochester, N. Y.

BLUE LABEL BRAND TOMATO JUICE.

Gibbs and Company, Inc., Baltimore.

GIBBS BRAND TOMATO JUICE.

Gibson Canning Company, Gibson City, Ill.

GIBSON BRAND TOMATO JUICE.

H. J. Heinz Company, Pittsburgh.

HEINZ BRAND TOMATO JUICE.

Edgar F. Hurff, Swedesboro, N. J.

HURFF BRAND Tomato Juice.

Jack Sprat Foods, Inc., Marshalltown, Iowa. *See* Western Grocery Company, Marshalltown, Iowa.

Kemp Brothers Packing Company, Frankfort, Ind., product distributed by the Sun-Rayed Company, Frankfort, Ind.

KEMP'S SUN-RAYED BRAND TOMATO JUICE.

Kuner-Empson Company, Brighton, Colo., product distributed by The Empson Packing Co., Brighton, Colo.

EMPSON'S BRAND TOMATO JUICE.

Product distributed by The Kuner Pickle Company, Brighton, Colo.
KUNER'S BRAND TOMATO JUICE

Libby, McNeill & Libby, Chicago.
LIBBY'S BRAND TOMATO JUICE.

The Loudon Packing Company, Terre Haute, Ind.
LOUDON and WEIDEMAN BOY BRANDS TOMATO JUICE.

Product distributed by American Packing Corporation, Evansville, Ind.
TRIPLE AAA BRAND TOMATO JUICE.

Marshall Canning Company, Marshalltown, Iowa. *See* Western Grocery Company, Marshalltown, Iowa.

Marshall Food Product Co., Marshalltown, Iowa. *See* Western Grocery Company, Marshalltown, Iowa.

The Naas Corporation of Indiana, Portland, Ind.
NAAS SUPREME BRAND TOMATO JUICE.
STEUBEN BRAND TOMATO JUICE.

North East Preserving Works, Inc., North East, Pa.
NORTH EAST BRAND TOMATO JUICE.

Orleans County Canning Company, Albion, N. Y.
DALE BRAND TOMATO JUICE.

E. Pritchard, Inc., Bridgeton, N. J.
PRIDE OF THE FARM BRAND TOMATO JUICE.

P. J. Ritter Company, Philadelphia, New York and Bridgeton, N. J.
RITTER BRAND TOMATO JUICE.

Stokely Bros. & Company, Inc., Indianapolis.
STOKELY'S BRAND TOMATO JUICE.

Product distributed by The Van Camp Packing Company, Inc., Indianapolis.

VAN CAMP'S BRAND TOMATO JUICE.

Sun-Rayed Company, Frankfort, Ind. *See* Kemp Brothers Packing Company, Frankfort, Ind.

Tomato Products Company, Paoli, Ind.
FRENCH LICK BRAND TOMATO JUICE.

Tugwell and Wiseman, Inc., Medeltown, N. Y.
BLUE BAR BRAND TOMATO JUICE.

The Van Camp Packing Company, Inc., Indianapolis. *See* Stokely Bros. & Company, Inc., Indianapolis.

Vincennes Packing Corporation, Vincennes, Ind.

ALICE OF OLD VINCENNES, FOOD KING, VINCENNES AND VINCO BRANDS TOMATO JUICE.

Wegner Canning Corporation, Sodus, N. Y.

WEGNER BRAND TOMATO JUICE.

Western Grocery Company, Marshalltown, Iowa, products distributed by Marshall Canning Company, Marshalltown, Iowa.

FAULTLESS and UNCLE WILLIAM BRANDS TOMATO JUICE.

Product distributed by Marshall Food Products Company, Marshalltown, Iowa.

MARSHALL BRAND TOMATO JUICE.

Product distributed by Jack Sprat Foods, Inc., Marshalltown, Iowa.

JACK SPRAT BRAND TOMATO JUICE.

The following firms distribute under their own labels tomato juice products purchased from manufacturers of accepted products now privileged to use the Seal of Acceptance. The labels and advertising conform to the Rules and Decisions of the Council.

Albany Packing Company Inc., Albany, N. Y.

FIRST PRIZE BRAND TOMATO JUICE.

Chas. W. Bauermeister, Terre Haute, Ind., product distributed by Good Morning Co-Operators, Terre Haute, Ind.

GOOD MORNING BRAND TOMATO JUICE.

John Blaul's Sons Co., Burlington and Cedar Rapids, Iowa.

FOUR BBBB BRAND TOMATO JUICE.

H. L. Caplan & Company, Inc., Baltimore.

BELVEDERE BRAND TOMATO JUICE.

M. J. Caplan & Company, Inc., Lawrence, Mass.

RADIO BRAND TOMATO JUICE.

Carpenter Cook Company, Menominee, Ishpeming, Iron Mountain and Escanaba, Mich.

WHITE BIRCH BRAND TOMATO JUICE.

Chapin Grocery Specialties Co., Inc., Springfield, Mass.

CHAPIN BRAND TOMATO JUICE.

Clover Farm Stores, Cleveland.

CLOVER FARM BRAND TOMATO JUICE.

College Inn Food Products Company, Chicago.

COLLEGE INN BRAND TOMATO JUICE.
COLLEGE INN BRAND TOMATO JUICE COCKTAIL.

Joseph Conner & Sons, Inc., Norwich, Conn.

RONNOC BRAND TOMATO JUICE.

Cressey Dockham & Company, Inc., Salem, Mass.

LESLIE BRAND TOMATO JUICE.

The Crosse & Blackwell Co., Baltimore.

CROSSE and BLACKWELL BRAND TOMATO JUICE.

Durand-McNeil-Horner Company, Chicago.
NONE-SUCH BRAND TOMATO JUICE.

Economy Grocery Stores Corporation, Boston.
ECCO BRAND TOMATO JUICE.

The L. E. Elliott Brokerage Company, Salina, Kan.
FAULTLESS BRAND TOMATO JUICE.

Falk & White Company, Lawrence, Mass.
MINUTE MAN BRAND TOMATO JUICE.

Fine Foods, Inc., Seattle and Minneapolis. *See* Gamble-Robinson, Seattle, and Minneapolis.

First National Stores, Inc., Boston and Somerville, Mass.
FI-NA-ST BRAND TOMATO JUICE.

Frankford Grocery Company, Frankford, Pa.
FRANKFORD BRAND TOMATO JUICE.

The E. H. Frechtling Company, Hamilton, Ohio.
FORT HAMILTON BRAND TOMATO JUICE.

Gamble-Robinson, Seattle and Minneapolis, product distributed by Fine Foods, Inc., Seattle and Minneapolis.
STANDBY BRAND TOMATO JUICE.

General Grocer Co., St. Louis, product distributed by Tibbits-Hewitt Grocery Company, St. Louis.
TOPMOST BRAND TOMATO JUICE.

Product distributed by Haas-Lieber Grocery Co., St. Louis.
AMERICAN LADY BRAND TOMATO JUICE.

Giandora Products Company, Warren, Pa. *See* Smith-Horton Co., Warren, Pa.

Good Morning Co-Operators, Terre Haute, Ind *See* Charles W. Bauermeister, Terre Haute, Ind

Gristede Bros., Inc., New York.
GRISDALE BRAND TOMATO JUICE.

Haas-Lieber Grocery Co., St. Louis. *See* General Grocer Co., St. Louis.

Hale-Halsell Company, McAlester, Okla.
HALE'S PRIDE BRAND TOMATO JUICE.

Halpen-Green Company, Philadelphia.
APOLLO BRAND TOMATO JUICE.

The Hudson Wholesale Grocery Company, Jersey City, N. J.

FILIGREE BRAND TOMATO JUICE.

H. A. Johnson Company, Boston and New York.
JOHNSON'S BESTOVALL BRAND TOMATO JUICE.

S. Kahn's Sons, Inc., Evansville, Ind.
DIAMOND ISLAND BRAND TOMATO JUICE.

Kansas City Wholesale Grocery Company, Kansas City, Mo.
FROG AND PICKWICK BRANDS TOMATO JUICE.

M. I. Kimball Co., Inc., Lawrence, Mass.
MILTON BRAND TOMATO JUICE.

King, Dobbs & Co., Chattanooga, Tenn.
FLEETWOOD BRAND TOMATO JUICE

Mazo-Lerch Company, Washington, D. C.
GOODYEAR and HERALD BRANDS TOMATO JUICE.

Miner, Read & Tullock, New Haven, Conn.
SUNRISE BRAND TOMATO JUICE.

Nash-Finch Company, Pawhuska, Okla.
FAULTLESS BRAND TOMATO JUICE

New England Importation Company, Boston.
MURI BRAND TOMATO JUICE.

Paxton and Gallagher Company, Omaha.
KAMO BRAND TOMATO JUICE.

Plee-Zing, Inc., Chicago.
PLEE-ZING BRAND TOMATO JUICE.

John Price & Company, Philadelphia.
GARDEN BRAND TOMATO JUICE

Radio Foods Corporation, Lawrence, Mass.
RADIO BRAND TOMATO JUICE.

The Ranney-Davis Mercantile Co., Arkansas City and Wichita, Kan.
SANTA FE BRAND TOMATO JUICE.

Rochester Packing Company, Inc., Rochester, N. Y.
ARPEAKO BRAND TOMATO JUICE

Smith-Horton Co., Warren, Pa., product distributed by Glendora Products Company, Warren, Pa.
GLENDORA BRAND TOMATO JUICE.

Staples Grocery Company, Inc., Richmond, Va.
MONOGRAM BRAND TOMATO JUICE.

The Jesse C. Stewart Company, Pittsburgh.
STEWART'S BRAND TOMATO JUICE.

Swift & Company, Chicago.
SWIFT'S BRAND TOMATO JUICE.

Tibbits-Hewitt Grocery Company, St. Louis. *See* General Grocer Company, St. Louis.

Twin City Wholesale Grocery Company, St. Paul, Minneapolis, and Fargo, N. D.
FAIRWAY WHITE LABEL BRAND TOMATO JUICE.

Twin Ports Wholesale Grocer Co., Duluth, Minn., and Superior, Wis.
FAIRWAY WHITE LABEL BRAND TOMATO JUICE.

United Service Stores, Boston.
UNITED SERVICE BRAND TOMATO JUICE.

Universal Food Stores, Inc., Norwich, Conn. *See* The Yantic Grain & Products Co., Norwich, Conn.

Wallace, Burton & Davis Company, New York.
SUPREME BRAND TOMATO JUICE.

The Weideman Company, Cleveland.
WEIDEMAN BOY BRAND TOMATO JUICE.

Ira Wilson & Sons Dairy Company, Detroit.
WILSON BRAND TOMATO JUICE.

Winston and Newell Company, Minneapolis.
18 K BRAND TOMATO JUICE.

Wood County Grocery Co., Inc., Wisconsin Rapids, Wis.
FAIRWAY WHITE LABEL BRAND TOMATO JUICE.

The Yantic Grain & Products Co., Norwich, Conn. Product distributed by Universal Food Stores, Inc., Norwich, Conn.
THAMES VALLEY BRAND TOMATO JUICE.

SECTION IV

Canned and Dried Fruits and Fruit Products

Fruits are important food items in the American diet. Citrus fruits, such as oranges, lemons and grapefruit, are outstanding sources of vitamin C. Raw apples in the quantities usually eaten in the American diet also are good sources of vitamin C. The yellow fruits, such as peaches and apricots, are good sources of vitamin A in the quantities that are usually consumed. Fruits are difficult to consider as a class because individual fruits differ greatly in composition. Over a long period of time these individual differences tend to cancel out, provided one selects a wide variety. Fruits, with but few exceptions, are low in protein and in fat. The figures in general show that most of the calories provided by fruits are derived from the carbohydrate content. In unripened fruits carbohydrate is present chiefly in the form of starch. During ripening, the starch formed in earlier stages gradually changes to sugar. The increase in sugar is commonly accompanied by a decrease in acids. All fruits contain some organic acid, which is usually malic or citric acid. Some fruits, such as the date, the fig and the banana, are so sweet that the acid is masked, and some, such as gooseberry, have sufficient acidity to mask any sweetening that is present. During the process of digestion the acids of fruits are oxidized to carbon dioxide, and for this reason fruits are considered alkaline foods.

The colors of fruits are chiefly anthocyanins, carotenoids and flavones. The characteristic fruity flavor is due to ethers, aldehydes, alcohols, or terpenes or else to a mixture of these.

The fruits described here are processed by being canned, dried or combined with other ingredients to form fruit products. Because of the necessity of limiting the scope of the Council, unpackaged fresh fruits are not considered for acceptance.

Contamination of Fruits and Vegetables with Toxic Insecticide Spray Material.—Fruits and vegetables are frequently sprayed with highly toxic material for destruction of insects or fungus. Residues of these sprays may remain on the foods as distributed for consumption or for use in preparation of canned or other prepared forms of fruits and vegetables and endanger public health.

Distributors of fruits and vegetables that may bear toxic spray material are obligated to remove such poisonous contaminations, before they enter commerce for retailing to the public, or to warn food manufacturers who will use the products for preparation of manufactured foods of the possible presence

of the spray residue. Food manufacturers using fruits and vegetables should take proper precautions either to assure the absence of toxic spray contaminations or their removal before the products are prepared or packed for consumption.

Food articles, in the interest of public welfare, shall bear or contain no toxic contaminations that may endanger health. Fresh fruits and vegetables likely to have been sprayed should be carefully washed with adequate water or special solvent solutions before use. Washing, however, does not assure removal of all spray materials. Distributors of fresh fruits and vegetables and manufacturers of foods containing these products bear a serious responsibility to the public that their products as presented for consumption are entirely wholesome; carelessness or disregard of this public health responsibility is criminal.

Tolerances for Arsenic, Copper and Lead in Foods.—Because of the recognized toxicity of certain metallic substances it is in the interest of public health to protect foods from contamination with such materials. Precautions should be taken in the manufacture, culture, treatment, preparation, processing, packing or preservation of foods that they shall not be contaminated with arsenic, copper or lead compounds or, if such contaminations are unavoidable, that they be reduced to amounts that are within the limits of safety. To this end equipment and materials used in the manufacture of prepared foods should be carefully guarded and controlled.

Foods to be eligible for acceptance shall not contain arsenic, copper or lead by contamination in excess of the following tolerances:

(a) 1.06 parts of arsenic (as As) per million of food [1.4 parts of arsenic (as As_2O_3) per million of food].

(b) 30 parts of copper (as Cu) per million of food.

(c) 2 parts of lead (as Pb) per million of food.

CANNED FRUITS

Fruits discussed in this section are those packed in syrup of various concentrations of sugar. Fruits that are packed in juice or water without added sugar or salt are discussed in section IX, entitled "Foods for Special Dietetic Purposes."

Federal Rules and Definitions.—Commercially canned fruits fall within the jurisdiction of the United States Department of Agriculture. Under the Food, Drug and Cosmetic Law, the Secretary of Agriculture can draw up standards of quality, condition, or fill for each class of canned fruit. These standards have the force of law. When products fail to qualify, the can must be labeled "Below U. S. Standard, Good Food—Not High Grade."

According to federal standards,[1] cans of fruit must be well filled and no more packing medium should be used than is necessary adequately to preserve the fruit. If a generous amount of liquid is added, the label on the can must bear the statement, "Below U. S. Standard, Contains Excess Liquid." If the air space between the food and the top of the can exceeds 10 per cent of the inside height of the container, the label must contain these words, "Below U. S. Standard, Slack Fill."

Federal definitions have been established for canned peaches, pears, apricots and cherries. There are no federal standards or definitions for canned pineapple, canned apple, canned fig or canned grapefruit at the present time.

Nutritive Value of Canned Fruits.—The vitamins natural to the fruit are retained in a high degree during canning, especially with commerical processes in which standard protective measures are employed, such as use of selected raw materials at the optimum state of maturity, prompt handling of the harvested crop, rapid inactivation of enzymes, removal of oxygen and exclusion of air.[2] Commercially canned fruits can be used interchangeably with their fresh counterparts in the diet if account is taken of the sugar and water added and of any vitamin losses due to the canning process

Apples

When eaten fresh, apples constitute an important source of vitamin C in the American diet. When cooked, they may be expected to lose a considerable quantity of this vitamin. Curran and Tressler [3] reported the vitamin C content (expressed as milligrams of ascorbic acid per hundred grams) of Northern Spy apples, fresh and cooked, to be as follows: fresh apple 11 mg., apple sauce 7 mg., baked apple 3.1 mg. and apple pie (three hours after baking) 2.4 mg. In other words, about 75 per cent of the total original ascorbic acid was lost during the preparation of apple sauce and 80 per cent lost during the baking of apples.

Malic acid is the only acid present in apples in appreciable amounts. Nelson,[4] by the method of ester distillation, found that Winesap apples contain *l*-malic acid together with a trace of citric acid, but in York Imperial he found no trace of citric acid.

1. Service and Regulatory Announcements, Food and Drug No. 4, fourth revision, United States Department of Agriculture, Food and Drug Administration, September 1937.

2. Fellers, C. R., and Isham, P. D.: Vitamin C in Canned Citrus Products, J. Home Econ. **24**: 827, 1932. Fellers, C. R.: The Effect of Processing on Vitamins in Fruits and Vegetables: A Review, Bulletin 338, Massachusetts State College Agricultural Experimental Station, 1936.

3. Curran, K. M.; Tressler, D. K., and King, C. G.: Losses of Vitamin C During Cooking of Northern Spy Apples, Food Research **2**: 549, 1937.

4. Nelson, E. K.: The Non-Volatile Acids of the Pear, Quince, Apple, Loganberry, Blueberry, Cranberry, Lemon and Pomegranate, J. Am. Chem. Soc. **49**: 1300, 1927.

Apples are canned as applesauce, baked apple, apple juice[5] and apple syrup.[6] They are also dried and powdered.[7] Apple pomace is a source of commercial pectin.

Canned apple sauce is prepared from several varieties of apples. The apples are carefully washed on roller conveyers by water sprays and peeled and cored by machine All blemishes and defects are cut out on trimming tables. The apples are emptied into a tank of salt water to prevent discoloration. After the salt bath they are again inspected on roller conveyers, washed by water sprays, sliced by machine and cooked in an applesauce cooker with the addition of water and sugar. The cooked apples are pulped, and seeds and harsh, fibrous parts are removed. The applesauce is automatically filled into cans or jars, which are sealed, processed under pressure and immediately cooled.

From time to time the Council has been concerned with the problem of lead in foods.[7a] Recently consideration was given to the problem of lead in certain products of the apple industry.[7b] In recent years culls have been converted into a syrup for use in the preparation of beverages. In some instances the apples are crushed without removal of the skins and cores and the macerated fruit is evaporated under diminished pressure, resulting in the preparation of a fragrant apple syrup having a high concentration of levulose. Such products, of course, ordinarily are diluted before use, but they are sold in the concentrated form. The concentrated juice presents a problem when the content of spray residues such as lead or arsenic or both exceeds the tolerances for these elements, even though after dilution the beverage may be considered satisfactory.

Apple products are not eligible for acceptance unless in the form in which they are marketed they contain less than two parts of lead (as Pb) and 1.06 parts of arsenic (as As) per million.

The average composition of applesauce, as reported by the manufacturers, is as follows: moisture 75 per cent, ash 0.2 per cent, salt (NaCl) 0.01 per cent, fat (ether extract) 0.1 per cent, protein (N $\times$ 6.25) 0.2 per cent, reducing sugars as invert sugar 9.5 per cent, sucrose (copper reduction method) 12.0 per cent, crude fiber 0.5 per cent, carbohydrates other than crude fiber (by difference) 23.6 per cent and titratable acidity as malic acid 0.4 per cent. Applesauce provides about 1.0 calory per gram; 28 per ounce.

---

5. Accepted brands of apple juice are listed in section III, entitled "Fruit Juices, Including Tomato Juice."

6. Accepted brands of apple syrup are listed in section X, entitled "Sugars and Syrups."

7. Accepted brands of apple powder are listed in section VI, entitled "Preparations Used in the Feeding of Infants."

7a. The Problem of Lead in Foods, Annual Meeting of the Council on Foods, J. A. M. A. **108**: 1891 (May 29) 1937. Ibid. **111**: 157 (July 9) 1938.

7b. Lead in Foods, Annual Meeting of the Council on Foods, J. A. M. A. **113**: 680 (Aug. 19) 1939.

The listed products of the following firms stand accepted.

The Hills Brothers Company, New York.

DROMEDARY BRAND BAKED APPLES, sweetened, packed in syrup of water and honey.

Analysis (submitted by manufacturer).—Moisture 67.1%, total solids 32.9%, ash 0.3%, fat (ether extract) 0.4%, protein (N × 6.25) 0.7%, crude fiber 0.7%, carbohydrates other than crude fiber (by difference) 30.8%, sucrose 2.4%, reducing sugars as dextrose 28.8%.

Calories—1.3 per gram; 37 per ounce.

Lyndonville Canning Company, Lyndonville, N. Y.

VB (VISSCHER BROTHERS) BRAND OLD FASHIONED APPLE SAUCE, canned sweetened apple sauce with added cane sugar.

Wegner Canning Corporation, Sodus, N. Y.

WEGNER NEW YORK STATE BRAND APPLE SAUCE, sweetened.

The following firms distribute under their own labels products purchased from manufacturers of accepted products now privileged to use the Seal of Acceptance. The labels and advertising conform to the Rules and Decisions of the Council.

General Grocer Company, St. Louis.

AMERICAN LADY BRAND APPLE SAUCE
TOPMOST BRAND APPLE SAUCE.

Haas Brothers, San Francisco, Oakland and Fresno, Calif.

TRUPAK BRAND APPLE SAUCE.

J. B. Le Frois & Sons, Rochester, N. Y.

LE FROIS' BRAND APPLE SAUCE, sweetened.

Grapefruit

Grapefruit is one of the citrus fruits. It is grown chiefly in Florida and Texas. Fresh or canned, it is an excellent source of vitamin C.

The grapefruits used for canning purposes are known as "cannery grade;" they consist of ripe sound fruit which is either too small or too large for the commercial fresh fruit market. Those with irregular shapes, thick peels or russet peels make up the canning stock. Sound "drops" are also used. These "drops" are of a better quality than many of the so-called packing house culls, or off grade fruit. Only fully matured fruit is used, as that which is slightly immature contains an excess of the glucoside naringin, which causes excessive bitterness, and also because the acid-sugar ratio is too wide, which gives a sharp acid flavor not present in the ripe fruit.

The grapefruits are washed and sorted free of rots. The good fruit is scalded to loosen the fleshy peel, which is removed by hand. The peeled fruit with part of the adhering white bitter rag is treated with alkali. From 2 to 4 per cent sodium hydroxide solution (82 C.) is sprayed from perforated pipes on the fruit, which is contained in shallow baskets on a chain drive belt. The fruit remains under the spray for only a few

seconds—never for more than sixty seconds, even in the early fruit season, when the rag is more difficult to remove. After passing the battery of hot alkali sprays, the fruit is subjected to a series of high pressure cold water sprays, which remove all of the loosely adhering rag and the alkaline solution.

The fruit sections are separated with sharp knives, graded and packed into cans by weight. A 50 per cent sucrose syrup is added, and the cans are then exhausted in a hot water bath (81-83 C.) for fifteen minutes. The temperature in the center of a can reaches 54-60 C. After exhaustion, the cans are sealed and processed in a hot water bath (76-82 C.) for from twenty-six to thirty minutes. Immediately after processing, the cans are plunged into a cold water bath, then labeled and boxed.

The average composition of canned grapefruit segments, as submitted by the manufacturers, is as follows: moisture (vacuum 70 C.) 85.9 per cent, ash 0.33 per cent, fat (ether extract) 0.1 per cent, protein ($N \times 6.25$) 0.5 per cent, reducing sugars as invert sugar 8.1 per cent, sucrose 2.9 per cent, higher carbohydrates as starch (acid hydrolysis method) 2.0 per cent, crude fiber 0.1 per cent, total carbohydrates (by difference) other than crude fiber 12.0 per cent and titratable acidity as citric acid 1.1 per cent. The product provides about 0.50 calory per gram; 14.2 per ounce.

The listed products of the following firms stand accepted.

The Hills Brothers Company, New York.

DROMEDARY BRAND FLORIDA GRAPEFRUIT SEGMENTS, sweetened canned segments of fully ripened Florida grapefruit packed in cane sugar syrup.

DROMEDARY BRAND FLORIDA GRAPEFRUIT, unsweetened.

DROMEDARY BRAND FLORIDA BLEND ORANGE-GRAPEFRUIT, a blend of grapefruit and orange segments, sweetened.

Dr. P. Phillips Company, Orlando, Fla.

COMMANDER BRAND GRAPEFRUIT SEGMENTS, sweetened.

DR. P. PHILLIPS FLORIDA FANCI-CUT GRAPEFRUIT SLICES, sweetened.

Tyrrell and Garth, Inc., Houston, Texas.

GARTH BRAND TEXAS PINK GRAPEFRUIT WHOLE SEGMENTS, sweetened.

GARTH BRAND TEXAS GRAPEFRUIT WHOLE SEGMENTS, sweetened.

FRUIT OF EDEN BRAND TEXAS PINK GRAPEFRUIT WHOLE SEGMENTS, sweetened.

FRUIT OF EDEN BRAND TEXAS GRAPEFRUIT WHOLE SEGMENTS, sweetened.

SUN MAGIC BRAND TEXAS PINK GRAPEFRUIT BROKEN SEGMENTS, sweetened.

SUN MAGIC BRAND TEXAS GRAPEFRUIT BROKEN SEGMENTS, sweetened.

The following firms distribute under their own labels products purchased from manufacturers of accepted products now privileged to use the Seal of Acceptance. The labels and advertising conform to the Rules and Decisions of the Council.

Chas. W. Bauermeister Company, Terre Haute, Ind.

GOOD MORNING BRAND FLORIDA GRAPEFRUIT HEARTS, sweetened.

H. C. Bohack Company, Inc., Brooklyn and Long Island, N. Y.

BOHACK'S BRAND GRAPEFRUIT, sweetened.

Grosberg-Golub Company, Inc., Schenectady, N. Y. *See* Sweet Life Food Corporation, Brooklyn.

Hale-Halsell Company, McAlester, Okla.
HALE'S PRIDE BRAND GRAPEFRUIT, sweetened.

Sweet Life Food Corporation, Brooklyn, product distributed by Grosberg-Golub Company, Inc., Schenectady, N. Y.
SWEET LIFE BRAND GRAPEFRUIT, unsweetened.

Figs

Figs are the fruit of *Ficus carica l-smyrnaca*, a tree chiefly grown in the Far East and in California. The fig is a pear-shaped fruit with a large stem; at maturity it shows a great diversity of color, which may be white, yellow, green, red, brown, blue, purple or black. The Kadota fig is the variety most commonly grown in California.[8] The Kadota fig tree normally produces two crops a year The main crop, usually harvested in September, October and November, is used for canning. The approximate composition of whole fresh figs is as follows: moisture 80 per cent, protein 1.3 per cent, acids as citric acid 0.17 per cent, sugars 15.5 per cent and ash 0.58 per cent. Figs on the dry basis contain about 4 to 6 per cent protein and 71 to 77 per cent sugars. The sugar content of fresh Kadota figs varies from 19 to 24 per cent. Dried Kadota figs contain from 60 to 70 per cent total sugar.

Figs are dried, canned or preserved and are used in various confections, biscuits and pastries.

Practically all canned figs on the market are of the California variety. In recent years the quality of figs grown in California for canning has been greatly improved.[9]

In canning, ripe figs are sorted by hand and mechanically graded for size. The figs are blanched with steam and light hot water sprays to remove any residue left from the spray and to reduce the thickness of the outer skin. Cans are filled with fruit and syrup containing a mixture of sucrose and corn sugar, with added lemon juice and salt; the cans are then preheated, sealed and heat processed.

The average composition of canned figs, as submitted by the manufacturers, is as follows: moisture 64.6 per cent, total solids 35.4 per cent, ash 0.5 per cent, fat (ether extract) 0.1 per cent, protein (N $\times$ 6.25) 0.5 per cent, total sugars as invert sugar 29.4 per cent, crude fiber 0.6 per cent, carbohydrates other than crude fiber (by difference) 33.5 per cent and acidity (as anhydrous citric acid) 0.2 per cent. The product provides about 1.4 calories per gram; 39 per ounce.

---

8. Condit, I. J., and Cruess, W. V.: The Kadota Fig and Kadota Fig Products, Bulletin 436, University of California Agricultural Experiment Station, 1927.

9. Smith, R. E., and Hansen, H. W.: Improvement of Quality in Figs, Circular 311, University of California Agricultural Experiment Station, 1927.

The listed products of the following firm stands accepted:

Beckwith Packing Corporation, Turlock, Calif.

CALIFORNIA FRESH FLAVOR BRAND KADOTA FIGS, packed in syrup containing a mixture of sucrose and corn sugar, with added lemon juice and salt.

Analysis (submitted by manufacturer).—Moisture 64.6%, total solids 35.4%, ash 0.5%, fat (ether extract) 0.1%, protein (N × 6.25) 0.5%, total sugars as invert sugar 29.4%, crude fiber, 0.6%, carbohydrates other than crude fiber (by difference) 33.5%, acidity (as anhydrous citric acid) 0.2%.

Calories.—1.4 per gram; 39 per ounce.

Cherries

The canned cherries that stand accepted by the Council on Foods are red or green Maraschino style cherries prepared from Royal Anne variety; hence only these products need be described. The cherries are immersed in a dilute solution of hydrochloric acid to remove spray residue, washed and placed in a from 0.5 to 1.5 per cent solution of sulfurous acid; this destroys any living organic matter, bleaches the fruit and preserves it until it is heated. The cherries are washed several times, pitted and stemmed by hand, blanched, again washed in cold water and colored in cold water with color certified by the United States Department of Agriculture. The fruit is heated in sugar syrup containing a small amount of citric acid and is allowed to stand in the syrup until the fruit and juice cool to room temperature. The cherries are drained and packed in bottles. Fresh syrup containing citric acid, oil of bitter almond or oil of peppermint flavoring and a small amount of alcohol is added, and the bottles are automatically sealed and heat processed.

Cherries thus canned are chiefly used as a garnish for desserts and beverages.

The listed products of the following firm stand accepted.

Fruit Products Corporation, Belleville, N. J.

ASTORIA BRAND RED CHERRIES, sweetened, bottled cherries containing oil of bitter almonds, citric acid, color certified by the United States Department of Agriculture and a small amount of alcohol to dissolve the flavoring.

Analysis (submitted by manufacturer).—Moisture 70.0%, total solids 30.0%, ash 0.2%, fat (ether extract) 0.2%, protein (N × 6.25) 0.2%, reducing sugars as invert sugar 5.6%, sucrose 22.8%, crude fiber 0.3%, carbohydrates other than crude fiber (by difference) 29.1%, sulfur dioxide none, sodium benzoate none, certified food color present, flavor present.

Calories.—1.2 per gram; 34 per ounce.

ASTORIA BRAND GREEN CHERRIES, sweetened, bottled cherries containing oil of peppermint, citric acid, color certified by the United States Department of Agriculture and a small amount of alcohol to dissolve the flavoring.

Analysis.—Same as for Astoria Brand Red Cherries.

Pineapple

The pineapple is the fruit of the Ananas, a plant native to the Western Hemisphere. Although the pineapple is referred to as a fruit, it is really a collection of small fruits, each with

its own core and spiny bracelet marking the spot where the flower appeared. The mature pineapple is usually 6 to 10 inches in height and weighs 5 to 8 pounds. The rind is tough and horny and composed of small hexagonal sections fitted together like pieces of tile. Each of these sections marks a botanically individual fruit. The color of the skin when the fruit is ripe is usually bright greenish orange shading to yellow-green. The flesh is juicy; it varies in color from white to deep yellow. The edible portion of the fruit surrounds a tough central core, which was originally the stalk of the flowers.

Canned pineapple is packed in a variety of forms, known as whole slices, half slices, spears, tidbits (uniform small sections), gems, crushed pineapple and juice. With the exception of certain grades of crushed pineapple and a small quantity of sliced fruit packed without sugar or salt, all canned products are put up with sugar syrup. The syrup is sometimes made from granulated sugar and water and sometimes from pineapple juice and sugar. The highest percentage of sugar is used for the "fancy" grade with somewhat less for the "standard" grade.

When used for canning, the pineapples are picked at a definite stage of ripeness, when the flavor is at its best. The crowns are cut off; the fruit is graded as to size and immediately shipped to the canneries, where it is distributed to special machines (ginaca machines), of which there are three sizes, each cutting the pineapple to a different diameter. The machines automatically "size" the pineapples, or cut out cylinders of a definite diameter from the fruit, extract the core and trim off the ends.

A certain amount of choice fruit adheres to the skin after the cylinder is cut out; this is separated from the skin by the same machine. This material is used for crushed pineapple. All parts of the pineapple not used in canning are used for the preparation of concentrated pineapple juice, which is neutralized, filtered and concentrated. The concentrated juice is sweetened with sucrose and is used as a syrup to add to the canned products.

On leaving the ginaca machines, the pineapple cylinders are transferred to canning tables, where uniformed operators wearing rubber gloves inspect the fruit and do whatever trimming is necessary. The trimmed fruit cylinders are washed with a water spray and automatically sliced. The slices are delivered to a packing table, where gloved operators select the slices for the three grades of canned products and fill the cans. The filled cans of pineapple receive a certain quantity of syrup. The use of pineapple juice syrup gives added pineapple flavor to the product. The cans are then automatiaclly closed in a vacuum closing machine. The sealed cans are heat processed under steam pressure and immediately cooled to about 50 C. Processed cans are inspected for any imperfections and crated for shipment.

For making the crushed pineapple, the fruit adhering to the skins is separated by machine, an operation in which the fruit is shredded. The shredded material is spread on a wide belt for inspection, and any undesirable parts are removed. Crushed pineapple is also obtained from slices which are irregular in shape and therefore unsuitable for the sliced product. The slices are crushed and shredded by machine. The crushed pineapple is cooked in steam-heated nickel kettles equipped with agitators and recording thermometers. The cooked material is automatically canned, sealed and cooled.

Canned pineapple may be expected to have the following composition: moisture 83.2 per cent, ash 0.5 per cent, fat (ether extract) 0.1 per cent, protein ($N \times 6.25$) 0.4 per cent, reducing sugar as invert sugar 6.1 per cent, sucrose (copper reduction method) 6.8 per cent, crude fiber 0.3 per cent, carbohydrates other than crude fiber (by difference) 14.7 per cent and titratable acidity as citric acid 0.8 per cent.

The caloric value of the canned pineapple depends on the sugar concentration of the syrup in which the fruit is canned. A hundred gram portion of standard pineapple would yield about 88 calories, while a hundred gram portion of fancy canned pineapple would yield 114 calories. Canned pineapple is considered a good source of vitamin C and contains some vitamin A.

The listed products of the following firms stand accepted.

Alexander & Baldwin, Ltd., Honolulu, Hawaii, products packed by the following subsidiary companies: Kauai Pineapple Company, Kalaheo, Kauai; Baldwin Packers, Ltd., Lahaina, Maui, and the Maui Pineapple company, Kahului, Maui.

FLOWER LAND BRAND PINEAPPLE BROKEN SLICES, sweetened.
HAWAIIAN CROSS BRAND PINEAPPLE CRUSHED, sweetened.
HAWAIIAN CROSS BRAND PINEAPPLE CRUSHED, juice packed, sweetened.
HAWAIIAN CROSS BRAND PINEAPPLE SLICED, sweetened.
HAWAIIAN CROSS BRAND PINEAPPLE TIDBITS, sweetened.
HAWAIIAN STAR BRAND PINEAPPLE CRUSHED, sweetened.
HAWAIIAN STAR BRAND PINEAPPLE SLICED, sweetened.
HAWAIIAN STAR BRAND PINEAPPLE TIDBITS, sweetened.
KING OF HAWAII BRAND PINEAPPLE CRUSHED, juice packed, sweetened.
KING OF HAWAII BRAND PINEAPPLE CRUSHED, juice packed.
KING OF HAWAII BRAND PINEAPPLE CRUSHED, juice packed, confectioners,' sweetened.
KING OF HAWAII BRAND PINEAPPLE DESSERT CUTS, sweetened.
KING OF HAWAII BRAND PINEAPPLE SLICED, sweetened.
KING OF HAWAII BRAND PINEAPPLE TIDBITS, sweetened.
MOUNTAIN TOP BRAND PINEAPPLE BROKEN SLICES, sweetened.
SURE HIT BRAND PINEAPPLE CRUSHED, sweetened.
SURE HIT BRAND PINEAPPLE SLICED, sweetened.

Hawaiian Pineapple Company, Ltd., San Francisco.

CORAL SEA BRAND PINEAPPLE HALF SLICES, sweetened.
DIAMOND HEAD BRAND DOLE PINEAPPLE CRUSHED, sweetened.
DIAMOND HEAD BRAND DOLE PINEAPPLE SLICED, sweetened.
DIAMOND HEAD BRAND DOLE PINEAPPLE TIDBITS, sweetened.
DISCOVERY BRAND DOLE PINEAPPLE SLICED, sweetened.
DISCOVERY BRAND DOLE PINEAPPLE CRUSHED, sweetened.
DISCOVERY BRAND DOLE PINEAPPLE BROKEN SLICES, sweetened.

DISCOVERY BRAND DOLE PINEAPPLE TIDBITS, sweetened.
DOLE BRAND PINEAPPLE CRUSHED, packed in heavy syrup.
DOLE BRAND PINEAPPLE TIDBITS, packed in heavy syrup.
DOLE BRAND PINEAPPLE SLICES, packed in heavy syrup.
DOLE BRAND PINEAPPLE GEMS, sweetened.
DOLE BRAND PINEAPPLE ROYAL SPEARS, sweetened.
HAWAIIAN CLUB BRAND DOLE PINEAPPLE CRUSHED, sweetened.
HAWAIIAN CLUB BRAND DOLE PINEAPPLE SLICED, sweetened.
HAWAIIAN CLUB BRAND DOLE PINEAPPLE TIDBITS, sweetened.
HONEY DEW BRAND DOLE PINEAPPLE CRUSHED, sweetened.
HONEY DEW BRAND DOLE PINEAPPLE SLICED, sweetened.
HONEY DEW BRAND DOLE PINEAPPLE TIDBITS, sweetened.
MAUNA LOA BRAND DOLE PINEAPPLE CRUSHED, sweetened.
MAUNA LOA BRAND DOLE PINEAPPLE SLICED, sweetened.
MAUNA LOA BRAND DOLE PINEAPPLE TIDBITS, sweetened.
PALM ISLAND BRAND DOLE PINEAPPLE CRUSHED, sweetened.
PALM ISLAND BRAND DOLE PINEAPPLE SLICED, sweetened.
PALM ISLAND BRAND DOLE PINEAPPLE HALF SLICES, sweetened.
PALM ISLAND BRAND DOLE PINEAPPLE TIDBITS, sweetened.
PALM ISLAND BRAND DOLE NO. 2 PINEAPPLE SLICED, sweetened.
PANAMA PACIFIC BRAND DOLE PINEAPPLE CRUSHED, sweetened.
PANAMA PACIFIC BRAND DOLE PINEAPPLE HALF SLICES, sweetened.
PANAMA PACIFIC BRAND DOLE NO. 2 PINEAPPLE SLICED, sweetened.
PARADISE BRAND DOLE PINEAPPLE CRUSHED, sweetened.
PARADISE ISLAND BRAND DOLE PINEAPPLE CRUSHED, sweetened.
PARADISE ISLAND BRAND DOLE PINEAPPLE SLICED, sweetened.
PARADISE ISLAND BRAND DOLE PINEAPPLE TIDBITS, sweetened.
PINEHEART BRAND DOLE PINEAPPLE CRUSHED, sweetened.
PINEHEART BRAND DOLE PINEAPPLE SLICED, sweetened.
PINEHEART BRAND DOLE PINEAPPLE TIDBITS, sweetened.
PLANTATION BRAND DOLE NO. 2 PINEAPPLE CRUSHED, sweetened.
PLANTATION BRAND DOLE NO. 2 PINEAPPLE SLICED, sweetened.
PLANTATION BRAND DOLE NO. 2 PINEAPPLE HALF SLICES, sweetened.
PLANTATION BRAND DOLE NO. 2 PINEAPPLE TIDBITS, sweetened.
RECIPE BRAND DOLE PINEAPPLE CRUSHED, sweetened.
RECIPE BRAND DOLE PINEAPPLE SLICED, sweetened.
RECIPE BRAND DOLE PINEAPPLE TIDBITS, sweetened.
SEA ISLAND BRAND DOLE PINEAPPLE SLICES, sweetened.
SEA ISLAND BRAND DOLE PINEAPPLE HALF SLICES, sweetened.
SURF RIDER BRAND PINEAPPLE CRUSHED, sweetened.
SURF RIDER BRAND PINEAPPLE HALF SLICES, sweetened.
SURF RIDER BRAND PINEAPPLE SLICED, sweetened.
SURF RIDER BRAND DOLE NO. 3 PINEAPPLE HALF SLICES, sweetened.
SWEET TREAT BRAND DOLE PINEAPPLE CRUSHED, sweetened.
SWEET TREAT BRAND DOLE PINEAPPLE SLICED, sweetened.
SWEET TREAT BRAND DOLE PINEAPPLE TIDBITS, sweetened.
TREASURE ISLAND BRAND PINEAPPLE CRUSHED, sweetened.
TREASURE ISLAND BRAND PINEAPPLE SLICED, sweetened.
TREASURE ISLAND BRAND PINEAPPLE TIDBITS, sweetened.
UKULELE BRAND DOLE NO. 2 PINEAPPLE CRUSHED, sweetened.
UKULELE BRAND DOLE NO. 2 PINEAPPLE SLICED, sweetened.
UKULELE BRAND DOLE NO. 3 PINEAPPLE HALF SLICES, sweetened.
WAIKIKI BRAND DOLE PINEAPPLE CRUSHED, sweetened.
WAIKIKI BRAND DOLE NO. 2 PINEAPPLE SLICED, sweetened.
WAIKIKI BRAND DOLE NO. 3 TIDBITS, sweetened.
WAIKIKI BRAND DOLE NO. 3 HALF SLICES, sweetened.

Libby, McNeill & Libby, Chicago.

LIBBY'S BRAND PINEAPPLE SLICED, sweetened.
LIBBY'S BRAND PINEAPPLE LONG SLICED, sweetened.
LIBBY'S BRAND PINEAPPLE TIDBITS, sweetened.
LIBBY'S BRAND PINEAPPLE DE LUXE STYLE LONG TIDBITS, sweetened.
LIBBY'S BRAND PINEAPPLE CRUSHED, sweetened.

The following firms distribute under their own labels products purchased from manufacturers of accepted products now privileged to use the Seal of Acceptance. The labels and advertising conform to the Rules and Decisions of the Council.

The Bindley Grocery Company, Marion, Ohio.

BAR-JOE BRAND PINEAPPLE SLICED, sweetened.
BINCO BRAND PINEAPPLE CRUSHED, sweetened.
BINCO BRAND PINEAPPLE TIDBITS, sweetened.
BINCO BRAND PINEAPPLE SLICED, sweetened.

Boswell Grocery Company, Kilgore, Texas.

BOSWELL'S BEST PINEAPPLE SLICED, sweetened.

Buddie Sales Company, Baltimore.

BUDDIE BRAND PINEAPPLE CRUSHED, sweetened.

The Burke Grocery Company, Cincinnati.

BURKE'S BRAND PINEAPPLE CRUSHED, sweetened.
BURKE'S BRAND PINEAPPLE SLICED, sweetened.

Butler Coal & Grain Company, Adams, Mass.

BERKSHIRE HILLS BRAND PINEAPPLE CRUSHED, sweetened.
BERKSHIRE HILLS BRAND PINEAPPPLE SLICED, sweetened.
BERKSHIRE HILLS BRAND PINEAPPLE TIDBITS, sweetened.

Butler Flour Company, Pittsfield, Mass.

BERKSHIRE HILLS BRAND PINEAPPLE CRUSHED, sweetened.
BERKSHIRE HILLS BRAND PINEAPPLE SLICED, sweetened.
BERKSHIRE HILLS BRAND PINEAPPLE TIDBITS, sweetened.

Campbell Holton and Company, Bloomington, Ill.

CAMEL BRAND PINEAPPLE CRUSHED, sweetened.
CAMEL BRAND PINEAPPLE SLICED, sweetened.
CAMEL BRAND PINEAPPLE MATCHED BROKEN SLICES, sweetened.
HAPPY HOUR BRAND PINEAPPLE CRUSHED, sweetened.
HAPPY HOUR BRAND PINEAPPLE SLICED, sweetened.
HAPPY HOUR BRAND PINEAPPLE TIDBITS, sweetened.

M. J. Caplan Co., Inc., Lawrence, Mass.

RADIO BRAND PINEAPPLE CRUSHED, sweetened.
RADIO BRAND PINEAPPLE SLICED, sweetened.

Downing, Taylor Company, Springfield, Mass.

FOREST PARK BRAND PINEAPPLE CRUSHED, sweetened.
FOREST PARK BRAND PINEAPPLE SLICED, sweetened.
FOREST PARK BRAND PINEAPPLE TIDBITS, sweetened.
WEDGEWOOD BRAND PINEAPPLE CRUSHED, sweetened.
WEDGEWOOD BRAND PINEAPPLE SLICED, sweetened.

The W. H. Dunne Company, Norwich, N. Y.

SUPREME COURT BRAND PINEAPPLE CRUSHED, sweetened.
SUPREME COURT BRAND PINEAPPLE SLICED, sweetened.

Durand-McNeil-Horner Company, Chicago.

BLOSSOM BRAND PINEAPPLE BROKEN SLICES, sweetened.
CLOVERHILL BRAND PINEAPPLE CRUSHED, sweetened.
CLOVERHILL BRAND PINEAPPLE SLICED, sweetened.
NONE-SUCH BRAND PINEAPPLE CRUSHED, sweetened.
NONE-SUCH BRAND PINEAPPLE SALAD CUTS, sweetened.
NONE-SUCH BRAND PINEAPPLE SLICES, sweetened.

Fine Foods, Inc., Seattle and Minneapolis. *See* Gamble-Robinson Company, Minneapolis.

Gamble-Robinson Company, Minneapolis, products distributed by Fine Foods, Inc., Seattle and Minneapolis.

STANDBY BRAND PINEAPPLE CRUSHED, sweetened.
STANDBY BRAND PINEAPPLE BROKEN SLICES, sweetened.
STANDBY BRAND PINEAPPLE SLICED, sweetened.
STANDBY BRAND PINEAPPLE CRUSHED, juice packed.
STANDBY BRAND PINEAPPLE BROKEN SLICES, juice packed.

Hale-Halsell Company, McAlester, Okla.

HALE'S LEADER BRAND PINEAPPLE CRUSHED, sweetened.
HALE'S LEADER BRAND PINEAPPLE SLICED, sweetened.
HALE'S PRIDE BRAND PINEAPPLE CRUSHED, sweetened.
HALE'S PRIDE BRAND PINEAPPLE SLICED, sweetened.
HALE'S PRIDE BRAND PINEAPPLE TIDBITS, sweetened.
HALE'S PRIDE BRAND PINEAPPLE LUMPS-O-GOLD, sweetened.

Harrisburg Grocery Company, Harrisburg, Pa.

AUNT NELLIE'S BRAND PINEAPPLE CRUSHED, sweetened.
AUNT NELLIE'S BRAND PINEAPPLE SLICED, sweetened.
AUNT NELLIE'S BRAND PINEAPPLE TIDBITS, sweetened.
KITCHEN QUEEN BRAND PINEAPPLE SLICED, sweetened.

The Herrman Company, Paterson, N. J.

DAISEE BRAND PINEAPPLE CRUSHED, sweetened.
DAISEE BRAND PINEAPPLE CRUSHED, fancy, sweetened.
DAISEE BRAND PINEAPPLE SLICED, sweetened.
DAISEE BRAND PINEAPPLE TIDBITS, sweetened.

Holmes-Swift Company, Augusta, Maine.

FORT WESTERN BRAND PINEAPPLE SLICES, sweetened.
FORT WESTERN BRAND PINEAPPLE CRUSHED, sweetened.
FORT WESTERN BRAND PINEAPPLE DAINTY SECTIONS (GEMS), sweetened.

G. E. Howard & Company, Newburg, N. Y.

SNOW BALL BRAND PINEAPPLE CRUSHED, sweetened.
SNOW BALL BRAND PINEAPPLE SLICED, sweetened.
SNOW BALL BRAND PINEAPPLE TIDBITS, sweetened.

Kansas City Wholesale Grocery Co., Kansas City, Mo.

PALLAS BRAND PINEAPPLE CRUSHED, sweetened.
PALLAS BRAND PINEAPPLE SLICED, sweetened.

Krekeler Grocer Company, St. Louis.

JOYFUL BRAND PINEAPPLE MATCHED HALVES, sweetened.
TOM BOY BRAND PINEAPPLE CRUSHED, sweetened.
TOM BOY BRAND PINEAPPLE SLICED, sweetened.

Jonathan Levi Co., Inc., Schenectady, N. Y.

WGY BRAND PINEAPPLE CRUSHED, sweetened.
WGY BRAND PINEAPPLE SLICED, sweetened.
WGY BRAND PINEAPPLE TIDBITS, sweetened.

Products also distributed by WGY Food Products Co., Inc., Schenectady, N. Y.

Lehmann-Higginson Grocer Company, Wichita, Kan.

LEHMANN'S BRAND DELUXE PINEAPPLE TIDBITS, sweetened.
LEHMANN'S BRAND DELUXE PINEAPPLE CRUSHED, sweetened.
LEHMANN'S BRAND DELUXE PINEAPPLE SLICES, sweetened.

J. B. Maltby, Inc., Corning, N. Y.

RED TURKEY BRAND PINEAPPLE SLICED, sweetened.
RED TURKEY BRAND PINEAPPLE CRUSHED, sweetened.
RED TURKEY BRAND PINEAPPLE SLICED, fancy, sweetened.
RED TURKEY BRAND PINEAPPLE TIDBITS, sweetened.

McTighe Grocery Company, Binghamton, N. Y.

BING BRAND PINEAPPLE SLICED, sweetened.
BING BRAND PINEAPPLE BROKEN SLICES, sweetened.
BING BRAND PINEAPPLE CRUSHED, sweetened.
BING BRAND PINEAPPLE TIDBITS, sweetened.
DELICIOUS BRAND PINEAPPLE CRUSHED, sweetened.
DELICIOUS BRAND PINEAPPLE SLICED, sweetened.

National Food Products Corporation, New York.

COLONIAL BRAND PINEAPPLE SLICED, sweetened.
SOUTHERN MANOR BRAND PINEAPPLE SLICED, sweetened.
SOUTHERN MANOR BRAND PINEAPPLE CRUSHED, sweetened.

D. Pender Grocery Co., Norfolk, Va.

SOUTHERN MANOR BRAND PINEAPPLE CRUSHED, sweetened.
SOUTHERN MANOR BRAND PINEAPPLE SLICED, sweetened.
SOUTHERN MANOR BRAND PINEAPPLE ROYAL SPEARS, sweetened.

Phillips-Lewis Co., Inc., Richmond, Va.

HOMESPUN BRAND PINEAPPLE CRUSHED, sweetened.
HOMESPUN BRAND PINEAPPLE SLICED, sweetened.
HOMESPUN BRAND PINEAPPLE TIDBITS, sweetened.

Prospect Supply Company, Yonkers, N. Y.

NEW LIBERTY BRAND PINEAPPLE CRUSHED, sweetened.
NEW LIBERTY BRAND PINEAPPLE SLICED, sweetened.

Rival Foods, Inc., Cambridge, Mass.

DORIS BRAND PINEAPPLE HALF SLICES, sweetened.
RIVAL BRAND PINEAPPLE CRUSHED, sweetened.
RIVAL BRAND PINEAPPLE SLICED, sweetened.
RIVAL BRAND PINEAPPLE TIDBITS, sweetened.

Roundy, Peckham and Dexter Company, Milwaukee.

DEXTER'S BRAND PINEAPPLE CRUSHED, sweetened.
DEXTER'S BRAND PINEAPPLE SLICED, sweetened.
DEXTER'S BRAND PINEAPPLE MATCHED SLICES, sweetened.
ROUNDY'S SUPREME BRAND PINEAPPLE CRUSHED, sweetened.
ROUNDY'S SUPREME BRAND PINEAPPLE SLICED, sweetened.
ROUNDY'S SUPREME BRAND PINEAPPLE TIDBITS, sweetened.
ROUNDY'S SUPERIOR BRAND PINEAPPLE SLICED, fancy, sweetened.
ROUNDY'S SUPERIOR BRAND PINEAPPLE SLICED, sweetened.
ROUNDY'S SELECT BRAND PINEAPPLE MATCHED SLICES, sweetened.

R. Schayowitz and Sons, Detroit.

GROSSE POINTE BRAND PINEAPPLE SLICED, sweetened.
GROSSE POINTE BRAND PINEAPPLE CRUSHED, sweetened.

Smart and Final Company, Ltd., Pasadena, San Bernadino, Santa Ana, Wilmington and Los Angeles, Calif.

S & F BRAND PINEAPPLE CRUSHED, sweetened.
S & F BRAND PINEAPPLE SLICED, sweetened.
S & F BRAND PINEAPPLE TIDBITS, sweetened.
TABLE QUEEN BRAND PINEAPPLE BROKEN SLICES, sweetened.
TABLE QUEEN BRAND PINEAPPLE CRUSHED, sweetened.
TABLE QUEEN BRAND PINEAPPLE SLICED, sweetened.

Henry Soodsma & Co., Paterson, N. J.

FALL LEAF BRAND PINEAPPLE SLICED, sweetened.
FALL LEAF BRAND PINEAPPLE CRUSHED, sweetened.
FALL LEAF BRAND PINEAPPLE TIDBITS, sweetened.

Steele-Wedeles Company, Chicago.

GOOD KIND BRAND PINEAPPLE CRUSHED, sweetened.
GOOD KIND BRAND PINEAPPLE SALAD CUTS, sweetened.
GOOD KIND BRAND PINEAPPLE SLICED, sweetened.
SAVOY BRAND PINEAPPLE CRUSHED, sweetened.
SAVOY BRAND PINEAPPLE SALAD CUTS, sweetened.
SAVOY BRAND PINEAPPLE SLICED, sweetened.
SAVOY BRAND PINEAPPLE TIDBITS, sweetened.

Wm. Steinmeyer Company, Milwaukee.

MANOLA BRAND PINEAPPLE CRUSHED, sweetened.
MANOLA BRAND PINEAPPLE SLICED, sweetened.
RED SHIELD BRAND PINEAPPLE CRUSHED, sweetened.
RED SHIELD BRAND PINEAPPLE SLICED, sweetened.

Twin City Wholesale Grocery Company, St. Paul and Minneapolis, and Fargo, N. D.

FAIRWAY BRAND PINEAPPLE CRUSHED, sweetened.
FAIRWAY BRAND PINEAPPLE SLICED, sweetened.
FAIRWAY BRAND PINEAPPLE TIDBITS, sweetened.

Twin Ports Wholesale Grocer, Superior, Wis., and Duluth, Minn.

FAIRWAY BRAND PINEAPPLE CRUSHED, sweetened.
FAIRWAY BRAND PINEAPPLE SLICED, sweetened.
FAIRWAY BRAND PINEAPPLE TIDBITS, sweetened.

United Fruit Stores, Inc., Providence, R. I.

BONNIE BRAND PINEAPPLE CRUSHED, sweetened.
BONNIE BRAND PINEAPPLE SLICED, sweetened.
BONNIE BRAND PINEAPPLE TIDBITS, sweetened.

United Grocers Company, Brooklyn.

UNITED BRAND PINEAPPLE CRUSHED, sweetened.
UNITED BRAND PINEAPPLE SLICED, sweetened.
UNITED BRAND PINEAPPLE TIDBITS, sweetened.

Waples-Platter Grocer Company, Fort Worth, Texas.

WAPCO BRAND PINEAPPLE BROKEN SLICES, sweetened.
WAPCO BRAND PINEAPPLE GRATED, sweetened.
WAPCO BRAND PINEAPPLE SLICED, sweetened.
WAPCO BRAND PINEAPPLE TIDBITS, sweetened.
WHITE SWAN BRAND PINEAPPLE CRUSHED, sweetened.
WHITE SWAN BRAND PINEAPPLE GRATED, sweetened.
WHITE SWAN BRAND PINEAPPLE SLICED, sweetened.

WGY Food Products Co., Schenectady, N. Y. *See* Jonathan Levi Company, Inc., Schenectady, N. Y.

White Villa Grocers, Inc., Cincinnati and Dayton, Ohio.

HONEY GROVE BRAND PINEAPPLE SLICED, sweetened.
WHITE VILLA BRAND PINEAPPLE SLICED, sweetened.

Wood County Grocer Co., Inc., Wisconsin Rapids, Wis.

FAIRWAY BRAND PINEAPPLE CRUSHED, sweetened.
FAIRWAY BRAND PINEAPPLE SLICED, sweetened.
FAIRWAY BRAND PINEAPPLE TIDBITS, sweetened.

DRIED FRUITS

Dried fruits are wholesome and useful food products. Prior to the development of canning, drying was the method most frequently used for preserving fruits during periods of plenty for periods of scarcity.

Fruits are dried either by exposure to the sun or in specially constructed dehydrators. Because certain fruits, particularly apricots, peaches and apples, darken rapidly during the drying process, it has became a commercial practice to treat the fruit with sulfur dioxide (SO_2) before drying. Samisch and Cruess [10] ascribed the rapid darkening in apricots to the existence of a complex enzyme substrate system capable of producing a brown color.

The question of the deleterious effect of sulfurous acid in dried fruits has long been disputed. Food Inspection Decision No. 76 of the United States Department of Agriculture, which is widely quoted in textbooks, states that the total amount of sulfur dioxide in the finished product must not exceed 350 mg. per kilogram. This decision is not enforced because of the confusion of opinions and the lack of convincing data as to the actual economic and physical effects of the use of dried fruit treated with sulfur. Much of the sulfured (sprayed with sulfur dioxide) dried fruit marketed in this country carries more than 1,000 parts of sulfur dioxide per million. Certain European states, France, for instance, have recently begun to enforce a law setting a maximum of 1,000 parts per million. In Hungary, Germany and Czechoslovakia, 1,250 parts per million is the legal maximum. New York has named 2,000 parts per million as maximum, and New Hampshire has recently prohibited sulfur dioxide in any amount whatever. Most of the states, however, have accepted the federal ruling indicated in Food Inspection Decision 89, issued in 1908, that "ordinary" quantities of sulfur dioxide, if stated on the label, are not objectionable. The objection to excessive sulfuring appears now to be based rather on the possibility of marketing excessively watery dried fruits rather than on the danger of physiologic injury resulting from their ingestion. Morgan and associates [11] have shown that treatment with sulfur dioxide actually preserves some of the vitamins natural to the fruit.

The Council on Foods concurs in the opinion that small quantities of sulfur dioxide are not objectionable in fruit products, provided the quantity does not exceed that compatible with good manufacturing practice, and provided the presence of sulfur dioxide is declared on labels of fruit products intended for infant feeding.

Hanus and Vorisek [12] reported that from 26 to 53 per cent of the original sulfur dioxide content of apricots is removed during the culinary treatment, such as soaking in water.

---

10. Samisch, R., and Cruess, W. V.: *Enzymic Darkening in Apricots*, Proc. Am. Soc. Horticult. Sc. (supp.) **31**: 28, 1934.

11. Morgan, A. F.; Field, A., and Nichols, P. F.: Effect of Drying and Sulfuring on Vitamin Content of Prunes and Apricots, J. Agricultural Research **42**: 35, 1931; Recent Studies of the Vitamin A and C Content of Dried Apricots and Figs, Fruit Prod. J. and Am. Vinegar Ind. **11**: 304, 1932. *See* also footnotes 21, 22 and 23.

12. Hanus, J., and Vorisek, J.: The Determination of Sulfur-Dioxide as a Preserving Agent in Dried Fruit, Chem. Lestz. **31**: 408, 1937.

Cocoanut

Cocoanut is the fruit of a variety of palm tree. Shredded cocoanut, desiccated or canned, is used extensively in domestic cookery and confectionery.

Shredded cocoanut is prepared from fresh cocoanut. The fresh cocoanuts are steamed in the shell to facilitate removal of the shell and inner rind. For the moist cocoanut marketed in paper cartons, the endosperm (the white oily substance) is cut from the spermoderm (the inner thin brown shell), washed, mechanically shredded and mixed with sucrose, salt and glycerin. The mixture is then dried in a current of air, sifted to secure shreds of uniform length, dried at room temperature to a moisture content of 5 per cent and packed automatically in cartons lined and wrapped with wax paper. Cocoanut packed in cans is dried to a moisture content of 18 per cent and packed in enamel-lined cans in which the air is replaced by carbon dioxide.

The listed products of the following firm stand accepted.

The Hills Brothers Company, New York.

DROMEDARY BRAND COCOANUT, partially dried shredded cocoanut with added sucrose, glycerin and sodium chloride.

Analysis (submitted by manufacturer).—Moisture 5.1%, total solids 94.9%, ash 0.8%, fat (ether extract) 41.0%, protein (N $\times$ 6.25) 4.3%, reducing sugars as invert sugar 0.8%, starch (acid hydrolysis method) 4.1%, sucrose 33.2%, crude fiber 4.1%, carbohydrates other than crude fiber (by difference) 40.4%, glycerin 4.3%.

Calories.—5.65 per gram; 161 per ounce.

DROMEDARY BRAND COCOANUT, partially dried shredded cocoanut with added sucrose and sodium chloride, packed in cans in an atmosphere of carbon dioxide.

Analysis (submitted by manufacturer).—Moisture 16.0%, total solids 84.0%, ash 0.3%, fat (ether extract) 41.4%, protein (N $\times$ 6.25) 4.4%, reducing sugars as invert sugar 0.5%, sucrose 25.3%, starch (acid hydrolysis method) 4.2%, crude fiber 4.2%, carbohydrates other than crude fiber (by difference) 33.7%.

Calories.—5.25 per gram; 149 per ounce.

Dried Dates

Dates are the soft sweet dry fruit of a variety of palm tree. This fruit, formerly imported from Persia and Africa, has become an established crop in Arizona and Southern California.

The approximate composition of dates is as follows: moisture 15 per cent, protein 2 per cent, fat 3 per cent, nitrogen-free extract 78 per cent and ash 1.3 per cent. Cleveland and Fellers [13] reported that Hallowi and Sayer dates from Iraq contain only invert sugar, the amount varying from 70 to 77 per cent. The usual moisture of dates is 14 to 20 per cent. The ash content is high, being respectively 2.02 and 1.94 per cent for Hallowi and Sayer varieties.

13. Cleveland, M. M., and Fellers, C. R.: Mineral Composition of Dates, Indust. & Engin. Chem. (Analyt. Ed.) 4: 267, 1932.

Dried dates are reported[14] to contain a small amount of vitamin B complex but no trace of vitamin A, C or D.

The dried dates imported from Mesopotamia are usually washed and pasteurized in ovens under a definite temperature of 160 to 185 F. and at a humidity of 70 to 100 per cent for thirty to ninety minutes. This processing is said to reduce the mold and bacteria from 93 to 99 per cent.

The listed products of the following firm stand accepted.

The Hills Brothers Company, New York.

DROMEDARY BRAND GOLDEN DATES, PITTED, pasteurized Mesopotamian dates in cartons.

Analysis (submitted by manufacturer).—Moisture 19.0%, ash 2.2%, fat (ether extract) 1.9%, protein (N × 6.25) 1.7%, sucrose 0.0, reducing sugars as invert sugar 73 5%, crude fiber 2.2%, carbohydrates other than crude fiber (by difference) 73.0, sulfur dioxide 0.0.

Calories.—3.16 per gram; 89.7 per ounce.

DROMEDARY BRAND GOLDEN DATES, PLAIN, pasteurized Mesopotamian dates in cartons.

Analysis (submitted by manufacturer).—Same as for Dromedary Brand Golden Dates, Pitted.

Dried Figs

A large proportion of the dried figs on the market are imported from Turkey. The quality of imported figs has greatly improved since insect control at the source was begun in 1927. Even before figs are picked from the tree, insects get into the fruit. One way to rid the fruit of insect infestation is to fumigate it with carbon disulfide (CS_2).[15] This type of fumigation is largely practiced. Unpackaged dried figs commonly become covered with a white sugary substance before processing, and occasionally figs become coated after processing, in the cartons. It was generally believed that this substance was sugar crystals, but Baker and Mrak[16] found it to consist of yeast cells and sugar crystals. The coating is not harmful, but it detracts from the appearance of the fruit.

Dried figs appear to contain vitamin A.[14] It has been reported in the literature that 30 per cent of the vitamin A content of figs is destroyed by drying. Figs contain only an insignificant amount of vitamin D and no vitamin C.[17]

The dried figs listed in this section are imported from Asia Minor. The figs are partially dried on the tree and then picked and further dried on trays in the sun. The dried figs are packed in vacuum tins for shipment to the United States. They are washed with hot water, cooked in a solution of glycerin and fig syrup (water extract of figs), removed from

14. Ali, M.: Der Vitamingehalt getrockneter Feigen und Datteln, Arch. f. Hyg. **107**: 219, 1932.
15. Stiner H.: Fumigators Enable Turks to Rid Figs of Insects, Food Industries **4**: 240, 1932.
16. Baker, E. E., and Mrak, E. M.: Yeasts Associated with the "Sugaring" of Dried Prunes and Figs, J. Bact. **36**: 317, 1938.
17. Joachimoglu, G., and Logaros, G.: Vitamin Content of Greek Foodstuffs: Vitamins, A. D and B_1 Contents of Dried Figs, Prakt. Akad. Athenon **11**: 383, 1936; abstracted, Chem. Abstr. **32**: 2181, 1938.

the solution, strained, cooled and packed in packages and jars. The figs in jars are sealed under vacuum and processed at 82 to 93 C.

The listed products of the following firm stand accepted:

Cresca Company, Inc., New York.

CRESCA BRAND SMYRNA LOCÓUM FIGS, partially dried cooked unsulfured figs from Asia Minor.

Analysis (submitted by manufacturer).—Moisture 27.9%, total solids 72.1%, ash 2.2%, fat 0.4%, protein (N × 6.25) 3.0%, reducing sugars as dextrose before and after inversion 51.3%, sucrose none, crude fiber 7.4%, carbohydrates other than crude fiber (by difference) 59.1%.

Calories.—2.5 per gram; 71 per ounce.

CRESCA HYGEIA BRAND SMYRNA LOCOUM FIGS, sun-dried cleaned unsulfured figs from Asia Minor.

Analysis (submitted by manufacturer).—Same as for Cresca Brand Smyrna Locoum Figs.

Prunes

Dried prunes are prepared from several varieties of prunes and prune plums. The common commercial practice of drying is as follows: Mature prune plums are immersed in boiling alkali solution for fifteen seconds to tenderize the skin in order to facilitate drying. The alkali is removed by water sprays. The fruit is then sulfured and dried, either on wooden trays in the sun for five to ten days or in dehydrators for twenty-four hours. The partially dried prunes are allowed to "sweat" in bins to equalize the moisture content before they are sent to central packing houses. Here they are cleaned by hot water sprays, passed slowly through nearly boiling water, shaken to remove adhering water, inspected and packed in paper or cellophane cartons.

The average composition [18] of dried prunes from California is as follows: Pits (percentage of entire prune) 14.9%, moisture 18.4%, total solids 81.6%, ash 2.2%, protein (N × 6.25) 2.8%, reducing sugars minus dextrose 44.3%, dextrose 29.7%, levulose (by difference) 14.6%, sucrose 2.2%, starch 1.0%, dextrin negligible, crude fiber 1.8%, total acid as citric acid 1.2%, calcium (Ca) 60 mg. per hundred grams, chlorine (Cl) 30 mg. per hundred grams, copper (Cu) 0.3 mg. per hundred grams, iron (Fe) 4 mg. per hundred grams, magnesium (Mg) 50 mg. per hundred grams, manganese (Mn) 0.5 mg. per hundred grams, phosphorus (P) 0.10%, potassium (K) 0.91%, sodium (Na) 70 mg. per hundred grams, sulfur (S) 20 mg. per hundred grams, potential alkalinity (excess of base-forming elements in cubic centimeters of normal alkali per hundred grams of prune flesh) 24. Dried prunes provide about 3.1 calories per gram of flesh; 88 per ounce.

Dried prunes contain a relatively large amount of iron. Foscani and Rezinikoff [19] reported that an average portion of

18. Analysis furnished by the United Prune Growers of California.
19. Foscani, V., and Rezinikoff, P.: The Iron Content of Foods Used in a Municipal Hospital, J. Nutrition 7: 79, 1934.

prunes furnishes 1.79 mg. of iron on the basis of 3.57 mg. per hundred grams. They placed prunes eighth on the list of foods furnishing significant amounts of iron per average serving. Lindow, Elvehjem and Peterson [20] reported that dried prunes as sold contain 0.41 mg. of copper per hundred grams.

Dried prunes contain about 1,000 U. S. P. (international) units of vitamin A, 70 international units of vitamin B_1, 20 international units of vitamin C and 270 Sherman Bourquin units of vitamin G (riboflavin) per hundred grams. Morgan and coworkers [21] found that dehydrated, sulfured prunes retain about 90 per cent of the vitamin A content of the fresh fruit. The practice of dipping in lye has no marked effect on the retention of vitamin A. They [22] also found that sulfuring protects the vitamin C present in the fruit. Prunes, however, are not important sources of vitamin C. Prunes do contain more vitamin B_1 and vitamin G (riboflavin) than have been reported for any other fruit.[23]

Prunes exert a slight laxative effect. The laxative principle in prunes, according to Emerson,[24] is due to a water-soluble agent with certain chemical and physiologic properties similar to those of dihydroxyphenylisatin, caffeic and chlorogenic acids.

The listed products of the following firm stand accepted.

Guggenhime & Company, San Francisco.

DAISY BRAND CALIFORNIA PRUNES, PITTED, partially dried whole ripe prune plums.

Analysis (an average analysis submitted by United Prune Growers of California)—Pits (percentage of entire prune) 14.9%, moisture 18.4%, total solids 81.6%, ash 2.2%, protein (N × 6.25) 2.8%, reducing sugars minus dextrose 44.3%, dextrose 29.7%, levulose (by difference) 14.6%, sucrose 2.2%, starch 1.0%, dextrin negligible, crude fiber 1.8%, total acid as citric acid 1.2%, calcium (Ca) 60 mg. per hundred grams, chlorine (Cl) 30 mg. per hundred grams, copper (Cu) 0.3 mg. per hundred grams, iron (Fe) 4 mg. per hundred grams, magnesium (Mg) 50 mg. per hundred grams, manganese (Mn) 0.5 mg. per hundred grams, phosphorus (P) 0.10%, potassium (K) 0.91%, sodium (Na) 70 mg. per hundred grams, sulfur (S) 20 mg. per hundred grams, potential alkalinity (excess of base-forming elements in cubic centimeters of normal alkali per hundred grams of prune flesh) 24.

Calories.—3.1 per gram of flesh; 88 per ounce.

Vitamins.—An assay (1934) showed 17.7 Sherman (6.3 U. S. P.) units of vitamin A, 0.8 Sherman-Chase (0.4 international) unit of vitamin B_1, and 2.8 Sherman-Bourquin (179 U. S. P.) units of vitamin G per gram; 176 U. S. P. units, 11 international units and 80 Sherman-Bourquin units respectively, per ounce.

---

20. Lindow, C. W.; Elvehjem, C. A., and Peterson, W. H.: The Copper Content of Plant and Animal Food, J. Biol. Chem. **82**: 465, 1929.
21. Morgan, A. F., and Field, A.: Vitamins in Dried Fruits: II. The Effect of Drying and of Sulfur Dioxide upon Vitamin A Content of Fruits, J. Biol. Chem. **88**:9, 1930.
22. Morgan, A. F., and Field, A.: The Effect of Drying and of Sulfur Dioxide upon the Antiscorbutic Property of Fruits, J. Biol. Chem. **82**: 579, 1929.
23. Morgan, A. F.; Hunt, M. J., and Squier, M.: The Vitamin B and G Content of Prunes, J. Nutrition **9**: 395, 1935.
24. Emerson, G.: The Laxative Principle in Prunes, Proc. Soc. Exper. Biol. & Med. **31**: 278, 1933.

DAPHNE BRAND CALIFORNIA PRUNES, same as Daisy Brand California Prunes, Pitted.

HELIOTROPE BRAND CALIFORNIA PRUNES, same as Daisy Brand California Prunes, Pitted.

LIBERTY BRAND PRUNES, PITTED, same as Daisy Brand California Prunes, Pitted.

MISSION BRAND CALIFORNIA PRUNES, same as Daisy Brand California Prunes, Pitted.

PANSY BRAND CALIFORNIA PRUNES, same as Daisy Brand California Prunes, Pitted.

PANSY BRAND SANTA CLARA PRUNES LARGE, same as Daisy Brand California Prunes, Pitted.

PANSY BRAND SANTA CLARA PRUNES MEDIUM, same as Daisy Brand California Prunes, Pitted.

PANSY BRAND SANTA CLARA PRUNES SMALL, same as Daisy Brand California Prunes, Pitted.

PHOENIX BRAND CALIFORNIA PRUNES, same as Daisy Brand California Prunes, Pitted.

ROSEDALE BRAND SANTA CLARA PRUNES, same as Daisy Brand California Prunes, Pitted.

Raisins

Raisins are dried grapes. Although there are varieties of grapes indigenous to America, most of the grapes used in wine and raisin production are of the European varieties which have been introduced in California. The two chief varieties of grapes used for the production of raisins are the Alexandria (muscat) and Sultanina (Thompson seedless). The common practice is to dip the grapes in lye to tenderize the skin and thus facilitate the drying process.

The average composition of raisins as given by Atwater and Bryant follows: water 14.6 per cent, protein 2.6 per cent, fat 3.3 per cent, nitrogen free extract and fiber 76.1 per cent and ash 3.4 per cent. The iron content of raisins as reported by Peterson and Elvehjem [25] is as follows: seeded raisins 6.99 mg. and seedless raisins 4.13 mg. per hundred grams as sold. Lindow, Elvehjem and Peterson also reported some copper in raisins: seeded raisins 0.27 mg. and seedless raisins 0.20 mg. per hundred grams as sold.

Fresh grapes contain vitamin A, and in view of the investigation of Morgan and co-workers dried sulfured raisins contain an amount of this vitamin commensurate with that found in the fresh grape.

The listed products of the following firm stand accepted:

Guggenhime & Company, San Francisco.

CARNATION PINK BRAND MUSCAT RAISINS, SEEDED, seeded sun-dried muscat grapes.

Analysis (submitted by manufacturer).—Moisture 17.3%, total solids 82.7%, ash 2.0%, protein (N × 6.25) 2.5%, reducing sugars as invert sugar 70.3%, carbohydrates (by difference) 76.7%, acidity as tartaric acid 1.5%, potential alkalinity (cubic centimeters of normal acid per hundred grams) 24, calcium (Ca) 70 mg. per hundred grams, chlorine (Cl) 60 mg. per hundred grams, copper (Cu) 0.3 mg. per hundred grams,

25. Peterson, W. H., and Elvehjem, C. A.: The Iron Content of Plant and Animal Foods, J. Biol. Chem. 78: 215, 1928.

iron (Fe) 7 mg. per hundred grams, magnesium (Mg) 50 mg. per hundred grams, phosphorus (P) 0.13%, potassium (K) 80 mg. per hundred grams, sodium (Na) 0.18%, sulfur (S) 80 mg. per hundred grams.

Calories.—3.2 per gram; 91 per ounce.

DAPHNE BRAND MUSCAT RAISINS, SEEDED, same as Carnation Pink Brand Muscat Raisins, Seeded.

FREE FLOWING SEEDED MUSCAT RAISINS, with added raisinseed oil.

FUCHSIA BRAND MUSCAT RAISINS, SEEDED, same as Carnation Pink Brand Muscat Raisins, Seeded.

HOLLY BRAND MUSCAT RAISINS, SEEDED, same as Carnation Pink Brand Muscat Raisins, Seeded.

HORSESHOE BRAND MUSCAT RAISINS, SEEDED, same as Carnation Pink Brand Muscat Raisins, Seeded.

PANSY BRAND MUSCAT RAISINS, SEEDED, same as Carnation Pink Brand Muscat Raisins, Seeded.

QUAKER BRAND MUSCAT RAISINS, SEEDED, same as Carnation Pink Brand Muscat Raisins, Seeded.

SANTA CLAUS BRAND MUSCAT RAISINS, SEEDED, same as Carnation Pink Brand Muscat Raisins, Seeded.

GAZELLE BRAND RAISINS, SEEDLESS, sun-dried Thompson Seedless grapes.

Analysis (submitted by manufacturer).—Moisture 17.0%, total solids 83.0%, ash 1.6%, fat 0.2%, protein (N $\times$ 6.25) 2.6%, reducing sugars as dextrose 72.7%, crude fiber 0.9%, carbohydrates other than crude fiber (by difference) 75.9%, titratable acidity as tartaric acid 1.8%, potential alkalinity (cubic centimeters of normal acid per hundred grams) 24, copper (Cu) 0.2 mg. per hundred grams, iron (Fe) 5 mg. per hundred grams, magnesium (Mg) 80 mg. per hundred grams, manganese (Mn) 0.4 mg. per hundred grams.

Calories.—3 2 per gram; 91 per ounce.

Vitamins.—The firm reports that an assay (1934) showed 0.8 Sherman-Chase (0.4 international) units of vitamin B_1 per gram; 11 international units per ounce

GLENWOOD BRAND THOMPSON RAISINS, SEEDLESS, same as Gazelle Brand Raisins, Seedless.

GLENWOOD BRAND THOMPSON RAISINS, SEEDLESS, same as Gazelle Brand Raisins, Seedless, with added refined raisinseed oil.

HORSESHOE BRAND RAISINS, SEEDLESS, same as Gazelle Brand Raisins, Seedless.

JOCKEY CLUB BRAND THOMPSON RAISINS, SEEDLESS, same as Gazelle Brand Raisins, Seedless.

MISSION BRAND THOMPSON RAISINS, SEEDLESS, same as Gazelle Brand Raisins, Seedless.

MISSION BRAND THOMPSON RAISINS, SEEDLESS, same as Gazelle Brand Raisins, Seedless, with added refined raisinseed oil.

PANSY THEY R SEEDLESS BRAND FANCY QUALITY RAISINS, same as Gazelle Brand Raisins, Seedless.

ROSEDALE BRAND FANCY THOMPSON RAISINS, SEEDLESS, same as Gazelle Brand Raisins, Seedless.

TEMPLE BRAND THOMPSON RAISINS, SEEDLESS, same as Gazelle Brand Raisins, Seedless.

FRUIT PRODUCTS

The products described in this section are canned concentrated juices, dried juice products, jellies and jams.

The concentrated and dried juice preparations are useful in the preparation of pleasant beverages and food dishes. The vitamin C content of these products is described under each product, when information is available.

Jams consist of fruit pulp and sugar Jelly differs from jam in that it contains fruit juice, sugar and pectin Since the preparation of jams and jellies involves comparatively long periods of cooking, the vitamins the fruit originally contained are destroyed, and hence the only food value of the products lies in the calories they afford

The listed products of the following firms stand accepted

Max Ams, Inc , New York

H & H BRAND PRUNE JAM prune jam made from dried prunes and cane sugar

Analysis (submitted by manufacturer) —Moisture 42 1%, total solids 57 9%, soluble solids 56 5%, ash 1 1%, fat (ether extract) 0 2%, protein (N × 6 25) 1 6%, sucrose 2 9%, reducing sugars as dextrose 37 3%, reducing sugars as invert sugar 38 9%, crude fiber 1 1%, carbohydrates other than crude fiber (by difference) 53 9%

Calories —2 24 per gram, 64 per ounce

The Appella Corporation, Yakima, Wash

APPELLA BRAND APPLE POWDER *See* section VI entitled "Preparations Used in the Feeding of Infants"

Birsley's, Hollywood, Calif

BIRSLEY'S BRAND CALIFORNIA ORANGE JUICE WITH LEMON JUICE a canned mixture of orange juice, lemon juice, sucrose, pectin and oil of orange

Analysis (submitted by manufacturer) —Moisture 51 8%, total solids 48 2%, ash 0 2% fat 0 03%, protein (N × 6 25) 0 4%, reducing sugars as invert sugar 6 9%, sucrose 39 0%, crude fiber 0 1%, carbohydrates other than crude fiber (by difference) 46 1%, titratable acidity as citric acid 1 4%

Calories —1 9 per gram, 54 per ounce

The Borden Company, New York, product distributed by Borden Sales Company, Inc , New York

MERRELL SOULE BRAND POWDERED LEMON JUICE AND CORN SYRUP, a spray dried mixture of lemon juice and corn syrup

Analysis (submitted by manufacturer) —Moisture 2 6%, total solids 97 4%, ash 1 0%, fat none, lemon oil 0 7%, protein (N × 6 25) 0 8%, reducing sugars as invert sugar 28 0%, dextrins (by difference) 55 4%, crude fiber none, titratable acidity as citric acid (anhydrous) 11 5%

Calories —3 43 per gram, 97 per ounce

Vitamins —A chemical titration (1936) shows 0 83 to 1 01 mg vitamin C per gram For a reconstituted lemon juice, dilution approximately 1 to 1, the average is 0 45 mg

Borden Sales Company, Inc., New York. *See* The Borden Company, New York

Citrus Concentrates, Inc., Dunedin, Fla.

SUNFILLED BRAND CONCENTRATED GRAPEFRUIT JUICE, canned, concentrated grapefruit juice.

Analysis (submitted by manufacturer).—Moisture 18 0%, total solids 82 0%, ash 2 8%, protein (N × 6.25) 4 5%, reducing sugar as invert 41 7%, sucrose 18 3%, carbohydrates (by difference) 65 5%, citric acid 9 2%, vitamin C (iodine titration) 3.7 mg. per gram, specific gravity 1.40.

Calories.—2.80 per gram; 80 per ounce.

Vitamins.—Chemical titration (1937) showed 74 international units of vitamin C per gram of concentrate. A beverage prepared by adding eleven parts of water and one part of concentrate by volume contains about 858 international units of vitamin C per 100 cc.; 254 per fluidounce.

SUNFILLED BRAND CONCENTRATED ORANGE JUICE, canned, concentrated orange juice.

Analysis (submitted by manufacturer).—Moisture 24.0%, total solids 76.0%, ash 2.7%, protein (N × 6.25) 3.5%, reducing sugar as invert 26.0%, sucrose 31.3%, carbohydrates (by difference) 63.3%, citric acid 6.5%, vitamin C (iodine titration) 2.5 mg. per gram, specific gravity 1.369.

Calories.—2.67 per gram; 76 per ounce.

Vitamins.—Chemical titration (1937) showed 50 international units of vitamin C per gram of concentrate. A beverage prepared by diluting one part of concentrate with nine parts of water by volume contains 685 international units of vitamin C per 100 cc.; 203 per fluidounce.

Fliedner-Kersten Corporation, Los Angeles.

Sun-Juce Brand Orange Sherbet Base, a canned pasteurized orange sherbet base containing ground unpeeled Valencia oranges, dextrose, water, citric acid (U. S. P.) and citric pectin.

Analysis (submitted by manufacturer).—Moisture 68.2%, total solids 31.8%, ash 0.3%, fat (ether extract) 0.1%, protein (N × 6 25) 0.7%, sucrose 0.3%, reducing sugars as invert sugar 20.2%, crude fiber 0.6%, carbohydrates other than crude fiber (by difference) 23.9%, *p*H 1 6, total acidity as citric acid 6.2%, alcohol precipitate (pectin substances) 13.5%, vitamin C (dye titration) 0.017%.

Calories. 0.99 per gram; 28 per ounce.

Food Concentrates, Inc., New York. *See* United Fruit Company, New York.

Glaser, Crandell Company, Chicago.

CRADLE BABY BRAND APRICOT JAM, strained and seedless.

Analysis (submitted by manufacturer).—Moisture 30 4%, total solids 69.6%, solids insoluble in water 0.9%, solids soluble in water 68.7%, ash 0.4%, protein (N × 6.25) 0.4%, crude fiber 0.3%, carbohydrates other than crude fiber (by difference) 67.7%, acidity 0 8%.

Calories.—2.72 per gram; 77 per ounce.

CRADLE BABY BRAND BLACK RASPBERRY JAM, strained and seedless.

Analysis (submitted by manufacturer).—Moisture 31 3%, total solids 68.7%, solids insoluble in water 0.4%, solids soluble in water 68.3%, ash 0.3%, protein (N × 6.25) 0.4%, crude fiber 0.1%, carbohydrates other than crude fiber (by difference) 67.1%, acidity 0.8%.

Calories.—2.70 per gram; 77 per ounce.

CRADLE BABY BRAND CURRANT AND RASPBERRY JAM, strained and seedless.

Analysis (submitted by manufacturer).—Moisture 31.2%, total solids 68.8%, solids insoluble in water 0.3%, solids soluble in water 68.5%, ash 0.3%, protein (N × 6.25) 0.7%, crude fiber 0.3%, carbohydrates other than crude fiber (by difference) 66.6%, acidity 0.9%.

Calories.—2.69 per gram; 76 per ounce.

CRADLE BABY BRAND FIG JAM, strained and seedless.

Analysis (submitted by manufacturer).—Moisture 25.5%, total solids 74.5%, solids insoluble in water 1.5%, solids soluble in water 73.0%, ash 0.6%, protein (N × 6.25) 0.8%, crude fiber 0.3%, carbohydrates other than crude fiber (by difference) 73.0%, acidity 0.2%.

Calories.—2.95 per gram; 84 per ounce.

CRADLE BABY BRAND GRAPE JAM, strained and seedless.

Analysis (submitted by manufacturer).—Moisture 30.5%, total solids 69.5%, solids insoluble in water 0.4%, solids soluble in water 69.1%, ash 0.3%, protein (N × 6.25) 0.4%, crude fiber 0.2%, carbohydrates other than crude fiber (by difference) 68.0%, acidity 0.6%.

Calories.—2.74 per gram; 78 per ounce.

CRADLE BABY BRAND PRUNE JAM, strained and seedless.

Analysis (submitted by manufacturer).—Moisture 30.0%, total solids 70.0%, solids insoluble in water 1.7%, solids soluble in water 68.3%, ash 0.7%, protein (N × 6.25) 0.7%, crude fiber 0.5%, carbohydrates other than crude fiber (by difference) 67.5%, acidity 0.6%.

Calories.—2.73 per gram; 78 per ounce.

The Hills Brothers Company, New York.

DROMEDARY BRAND VELVA DATE, date preserve prepared from water, dates, invert sugar, honey and salt.

Analysis (submitted by manufacturer).—Moisture 21.3%, total solids 78.7%, ash 0.6%, fat 0.3%, protein (N × 6.25) 0.9%, reducing sugars as invert sugar 59.8%, sucrose 7.6%, crude fiber 1.2%, carbohydrates other than crude fiber (by difference) 75 7%.

Calories.—3.1 per gram; 88 per ounce.

Libby, McNeill & Libby, Chicago.

LIBBY'S BRAND LOGANBERRY DELIGHT, containing loganberry juice, water and cane sugar.

Analysis (submitted by manufacturer).—Moisture 83.1%, total solids 16.9%, ash 0.2%, fat 0.01%, protein (N × 6.25) 0.2%, total sugars 15.0%, crude fiber trace, carbohydrates other than crude fiber (by difference) 15.3%, total acidity (as malic acid) 1.2%, *p*H 3.02, sodium (Na) 24 mg. per hundred grams, potassium (K) 84 mg. per hundred grams, calcium (Ca) 8 mg. per hundred grams, magnesium (Mg.) 9 mg. per hundred grams, iron (Fe) 0.4 mg. per hundred grams, phosphorus (P) 5 mg. per hundred grams, sulfur (S) 2 mg. per hundred grams, chlorine (Cl) 13 mg. per hundred grams and iodine (I) 0.0016 to 0.0025 mg. per hundred grams.

Calories.—0.62 per gram; 18 per ounce.

Merck & Co., Inc., Rahway, N. J.

MERCK'S BANANA POWDER. *See* the part of section VI entitled "Preparations Used in the Feeding of Infants."

Frederick Stearns and Company, Detroit.

STEARNS' APPELLA BRAND APPLE POWDER. *See* section VI "Preparations Used in the Feeding of Infants."

United Fruit Company, New York, product distributed by Food Concentrates, Inc., New York.

BANANA POWDER. *See* section VI "Preparations Used in the Feeding of Infants."

SECTION V

Grain Products

Cereals are defined as the fruit produced by members of the grass family. Their high starch content and relatively low water content are characteristic. Because of their cheapness and availability, they have always been among the chief foods of civilized man.

Although in recent years there has been a steady decrease in the use of cereals in the United States, cereal products still account for more than a fourth of the total caloric intake. Wheat products constitute about 75 per cent of the total cereals used.[1]

Table 1, containing data on the consumption of wheat in the United States during certain periods, shows the gradual

TABLE 1.—*Wheat Consumption Per Capita*

Yr.	Kg. per Yr.	Gm. per Day	Calories per Day
1894-1899	145.6	399	1,596
1909-1914	140.2	384	1,536
1929-1934	100.2	274	1,096

decrease in the consumption of wheat. The Mixed Committee on Nutrition of the League of Nations, in commenting on this trend, reported[2] that the decline appears

> . . . to have been greatest in the countries where the great bulk of the cereal consumption consists of wheat. These are, in general, the countries with the highest levels of living; as incomes rose, there was a partial substitution of more expensive non-cereal foods for wheat. In countries where rye or maize was the principal cereal, there has, on the other hand, been a tendency towards their displacement by wheat.

In addition to the general rise in the scale of living, there are factors to which the declining consumption of wheat has been attributed by various observers. These are the general reduction in caloric requirements due to lessened hours of work and the use of automobiles in place of walking, the increased availability of fresh vegetables and fruits in metropolitan markets and the increasing realization of the nutritional shortcomings of refined cereal products, which account for much of the wheat consumption.

1. The Place of Wheat in the Diet, Wheat Studies, Stanford University, Calif., Food Research Institute, 1929, vol. 5, no. 4.
2. Nutrition: Final Report of the Mixed Committee of the League of Nations on the Relation of Nutrition to Health, Agriculture and Economic Policy, New York, Columbia University Press, 1937, no. A13, p. 102.

Alleged Toxic Effects of Grain Products.—In the past several years considerable publicity has been given to the supposedly unfavorable effect of cereals on the calcification of teeth and bones. Wheat and most other cereals were reported by Green and Mellanby [3] to exert, in animals fed a diet deficient in vitamin D, an anticalcifying effect. In 1937 the Council on Foods [3a] reviewed the evidence on the alleged decalcifying effect of cereals. According to this report, the experimental results observed and reported in the literature may be explained on the basis of the calcium and phosphorus ratio in the diet and the availability of the phosphorus. There is no good evidence of the existence of a decalcifying factor in cereals, and the hypothesis of the existence of such a factor is not needed to explain experimental results.

For many years livestock producers in certain localities have complained of unsatisfactory growth and reproduction in domestic animals; some farmers associated this condition with grain products grown on certain tracts of land. As a result of collaborative work on the part of several investigators,[4] it was found that the toxic grains were grown on soil that contained selenium, chrominum, vanadium and arsenic. It was also found that when selenium was added to soil even in minute quantities, the element was absorbed by wheat plants, with the production of a compound extremely toxic to rats and guinea pigs. Franke [5] reported that the toxicant in wheat and corn grown on soil containing selenium is carried in the protein fraction of these grains. The exact nature of the toxicant is not known. At present, the production of grain products has been abandoned in regions in which the soil contains selenium. Wheat and corn grown on soil that does not contain selenium are wholesome foods and have no toxic effects.

In 1937, Rowntree [6] and his co-workers reported the interesting observation that administration of crude wheat germ oil to rats in doses ranging from 1 to 5 cc. daily was associated with the development of sarcoma in three weeks to six months.

---

3. Green, H. N., and Mellanby, E.: A Rat Technique for Demonstrating the Interfering Effect of Cereals on Bone Calcification, Biochem. J. **22**: 102, 1928.

3a. The Alleged Decalcifying Effect of Cereals, report of the Council on Foods, J. A. M. A. **109**: 30 (July 3) 1937.

4. Robinson, W. O.: Determination of Selenium in Wheat and Soils, J. A. Off. Agric. Chemists **16**: 423, 1933. Byers, H. G.: Selenium, Vanadium, Chromium, and Arsenic in One Soil, Indust. & Engin. Chem. (News Ed.) **12**: 122, 1934. Nelson, E. M.; Hurd-Karrer, A. M., and Robinson, W. O.: Selenium as an Insecticide, Science **78**: 124, 1933.

5. Franke, K. W.: A New Toxicant Occurring Naturally in Certain Samples of Plant Foodstuffs: I. Results Obtained in Preliminary Feeding Trials, J. Nutrition **8**: 597 (Nov.) 1934; II. The Occurrence of the Toxicant in the Protein Fraction, ibid. **8**: 609 (Nov.) 1934.

6. Rowntree, L. G.; Steinberg, A.; Dorrance, G. M., and Ciccone, E. F.: Sarcoma in Rats from the Ingestion of a Crude Wheat-Germ Oil Made by Ether Extraction, Am. J. Cancer **31**: 359 (Nov.) 1937; Sarcoma in Rats Resulting from the Ingestion of Crude Wheat-Germ Oil Made by Ether Extraction, Pennsylvania M. J. **41**: 784 (June) 1938.

The nature of the sarcogenic agent is not known. Negative results were obtained when refined wheat germ oil, instead of the crude oil, was administered over nine months. Likewise a diet of 50 per cent wheat germ produced no tumors in more than ten months. Other investigators have found likewise that wheat germ is not harmful, and have not been able to duplicate the results of Rowntree and his collaborators on the toxicity of wheat germ oil to experimental animals.

The foregoing discussion is presented in order to emphasize the Council's view that wheat and its products are wholesome foods for human consumption.

Scope of This Section.—Accepted products described in this section are those derived from wheat, corn, rice, oats and barley. A description of each grain and the products derived from it will be given in the subsequent pages.

WHEAT PRODUCTS

Wheat has been a most important food ever since the first bearded wheat berries ripened to red gold in a field of grass on the ancient Abyssinian Plateau. In world production of wheat the United States ranks second, one place behind the top-ranking Soviet Union. In an average year the total production of wheat in the United States amounts to some 800,000,000 bushels.

In the United States most of the wheat is grown in an enormous square of land, extending from Ohio to Kansas and from Texas to North Dakota. Washington, Oregon and Idaho also produce some wheat; wheat is grown to some extent in many other states.

Many persons do not realize that there are many varieties of wheat. It is customary to divide wheat into several classes, namely, hard red spring wheat, durum wheat, red durum wheat, hard red winter wheat, soft red winter wheat and white wheat. There may also be mixtures of these wheats. The flour made from each type of wheat has characteristics which make it particularly valuable for certain purposes. Thus, macaroni is made from durum wheat flour, other varieties of wheat are best suited for the production of bread flour, and other types of flour. Definitions and standards for each class and subclass have been described by the milling trade.[7]

The hard red winter wheats make up the largest and, in many respects, the most important commercial class of wheat in the United States. More than 27,000,000 acres, nearly half of the total wheat acreage in the United States, was occupied by this class of wheat in 1934.[8] It is grown principally in the Great Plains, in the central and south central areas, where hot summers and rather severe dry winters prevail. Kansas,

7. Revised United States Grain Standards for Wheat, Northwestern Miller (sect. 2) **198**: 14 (April 26) 1939.

8. Quisenberry, K. S., and Clark, J. A.: Hard Red Winter Wheat Varieties, Farmers' Bulletin 1806, United States Department of Agriculture, December 1938.

Texas, Oklahoma and Nebraska lead in the production of hard red winter wheat. Thirty-four varieties are grown commercially in the United States, and these are known under many different names, Turkey, Khorkof, Blackhull, Kanred and Nebraska No. 60 being a few of the leading varieties.

The hard red spring wheats of commerce are grown largely in the northern portion of the Great Plains, in Minnesota, North Dakota, South Dakota and Montana. Durum wheat is grown in essentially the same region as the hard red spring wheat. Soft red winter wheats are grown extensively in Missouri and in the states extending eastward to the Atlantic Coast. Varieties of white wheat are grown to a limited extent in Michigan and New York, but chiefly in the intermountain area and in the Pacific Coast districts.

The comparative milling and baking qualities of the various classes of American wheat were summarized in convenient form by Thomas.[9]

The composition and properties of wheats vary with the variety and the growing conditions. Hard and soft wheats differ chiefly in the proportion of protein in the endosperm. This factor is important in determining the baking qualities of the flour. Durum wheat has a high protein content and is used largely for the preparation of alimentary pastes.

Structure of the Wheat Kernel.—The wheat kernel consists essentially of three parts: the layer of bran, the germ and the endosperm. In round figures, the wheat berry is made of 84 to 86 per cent endosperm, 13 to 15 per cent bran and 2.2-2.9 per cent germ.

The endosperm is a relatively large reservoir of reserve plant food, which is utilized in the germination of the grain and in the growth of the seedling. The starchy endosperm is more or less pliable; it tends to fracture and pulverize when ground between rollers.

The germ, or embryo, of wheat is that portion of the grain in which germination is initiated. It is obtained from the mill as flattened yellow disks, which usually contain some bran. The germ comprises approximately 2.2 to 2.9 per cent of the whole grain, the proportion depending on the variety.[10] Although the germ formerly was used for feeding stock or was discarded, it has recently become popular as a human food because of its high content of vitamin B_1. For such use, the germ is carefully separated from bran and endosperm and treated to improve its keeping qualities. The chemical composition and nutritive value of wheat germ is discussed in section IX, entitled "Foods for Special Dietetic Purposes."

9. Thomas, L. M.: A Comparison of Several Classes of American Wheats and a Consideration of Some Factors Influencing Quality, Farmers' Bulletin 557, United States Department of Agriculture, 1917.

10. Bailey, C. H.: Germ Content of American Wheats, Cereal Chem. **15**: 102 (Jan.) 1938.

Wheat Flour

The Council on Foods has accepted about 180 manufacturer and merchant brands of flour. Most of these flours are produced by only a few firms In 1934 and 1935 thirteen large milling companies milled the equivalent of 47 per cent of the total flour produced in this country. The three largest milling companies sold 29 per cent of the total flour sold in the United States in this period, and the largest milling company sold 16 per cent of the total flour [11]

White wheat flour is defined as the finely ground product obtained in the commercial milling of wheat, consisting essentially of the starch and gluten of the endosperm. It contains not more than 15 per cent moisture, not less than 1 per cent nitrogen and not more than 0.5 per cent fiber. Whole wheat flour, also known as graham flour, is defined as the product made by grinding wheat, and containing, in their natural proportions, all of the constituents of the cleaned grain.

The Milling Process.—Flour milling is essentially the separation of the three parts of the wheat berry—the layer of bran, the germ and the endosperm. The purpose of milling is to separate these three components as efficiently as possible.

The separation is not quantitative, however. The average roller mill does not recover as merchantable flour more than 72 to 75 per cent of the potential 82 to 85 per cent of the flour in the endosperm. In increasing proportions, fragments of bran and germ appear in the flours as they progress from the most highly refined to the lower grades, while substantial losses of endosperm are sustained in the by-products, such as bran and shorts.

The milling of wheat involves the following processes [11a]:

1. Cleaning the Wheat: Separating the wheat berries from the seeds of weeds, such as ragweed, corn cockle, wild vetch or smut balls, which are peculiar to the region where wheat is grown.

2. Conditioning the Wheat: Washing and tempering the wheat berries in water in order to toughen the layers of bran and thus facilitate the subsequent separation when wheat is ground and bolted.

3. Breaking the Wheat Berry: Grinding the wheat grains through a series of corrugated rollers known as breaks. In passing through these rollers the bran and germ are flattened, the starchy part of the endosperm is pulverized, and the outer layer of the endosperm, which is of horny consistency and of relatively high protein content, is broken into granules.

4. Bolting, or Sifting: After each grinding on the break rollers, the material is bolted to effect a separation of the particles of varying degrees of fineness.

---

11. The Drama of Wheat, Consumers Guide 4: 7 (Feb. 14) 1938.

11a. Cited by Bailey, C. H.: The Chemistry of Wheat Flour, New York, The Chemical Catalog Company, 1925, p. 123.

5. Purification: A sifting and aspiration process which lifts out the more flaky and fibrous particles of bran from the middlings, to give a product known as purified middlings.

6. Reduction: Grinding purified middlings between smooth iron rollers. Flour produced by the first grinding of any stream of purified middlings is more highly refined and freer from fiber than that produced by subsequent grinding of the coarse residues.

In a five break, seven reduction mill system, there are thirty-two standard streams of flour. Each of these streams has a different chemical composition. Because the ash content of the endosperm is low, running from 0.28 to 0.38 per cent, while the ash content of the bran is high, running from 5.5 to, in some instances, as much as 8 per cent, the amount of ash in the various streams of flour enables the miller to determine how efficient is the separation of the flour from the bran. It also enables him to combine suitable streams of flour for the trade. Other chemical and physical tests are also used as guides in the selection of flour for different uses.

Uses of Flour.—Wheat flour is the only cereal product from which a light loaf of bread can be made. This is due to a group of proteins, especially glutens, which are capable, with starch, of attaining a degree of elasticity and viscosity which permits the retention of some of the gases developed within the material and so produces a light loaf of bread. The only satisfactory test of these properties of flour is to bake a loaf of bread and to examine the product.[12]

The baking test gives information regarding the extent, character, intensity and permanence of such damage as may exist.[12] The information may be corroborated by certain chemical tests, such as those for acidity, soluble carbohydrates and soluble nitrogenous compounds. The baking test frequently will disclose abnormal odors when no other methods of testing give indication that the flour is not just right.

Baking strength may be defined[13] as that unique characteristic of wheat flours by reason of which, in varying degrees, they are capable, when fermented with yeast, of yielding large light spongy evenly cellular doughs which, when baked, retain the same light structural character. Under suitable conditions, the volume of the loaf obtained measures the degree of baking strength.

Terms Used to Describe Different Types of Flour.—Flour obtained by the roller milling process is known as patent flour. The term "patent" has been used in connection with white flour since about 1870. Previous to this time the miller was unable

12. Briggs, H.: What Do Baking Tests Disclose? Northwestern Miller & Am. Baker 6: 745, 1929; abstracted, Chem. Abstr. 24: 3287, 1930.

13. Briggs, H.: The Question of Baking Strength, Northwestern Miller & Am. Baker 6: 1107 and 1123, 1929; abstracted, Chem. Abst. 24: 3288, 1930.

to remove the fine particles of bran that would go into the white flour. In order to improve this condition the "purifier" was developed. This machine causes a suction of air to draw the particles of bran into a separate stream This process was patented, and flour made by this process was called patent flour.[14]

The history of patent flour was traced by Dedrick[15] from the time when middlings were produced by stone grinding and the purifier was first developed, down to the present time, with its confusion of terminology. It was stated that no flour constituting more than 80 per cent of the total flour can justly be called a patent, and in a 75 per cent patent the ash content should not exceed 0.36 to 0.37 per cent. Bailey[16] stated the belief that this limit was probably intended for soft winter wheat patents, as a hard winter wheat patent has a consistently higher ash content. Bailey suggested the following definitions for the different grades of flour:

1. "Flour" is finely ground, bolted wheat meal.

2. "Straight flour" (or 100 per cent flour) is all the bolted wheat meal recovered from the wheat after removal of the feeds.

3. "Patent flour" is the more refined portion of the wheat meal from which all or a portion of the clears have been removed.

4. "Clear flour" is the less refined, bolted portion of the wheat meal recovered in the manufacture of patent flour. (Millers, according to their processing or trade demand, divide this into first and second clear flour.)

5. "First clear flour" is the better portion of the clear flour after separation into two parts.

6. "Second clear flour" is the portion of the clear flour which remains after the first clear flour is removed.

Bailey also suggested that the term "yield" should refer to the proportion or percentage of the cleaned and untempered wheat that is converted into straight grade flour. This may be reported either in terms of percentage of wheat or in terms of the quantity of wheat required to produce a 196 pound barrel of straight grade flour. "Extraction" should refer to the percentage of straight grade flour which appears in each grade marketed. Thus a patent of 70 per cent extraction should constitute 70 per cent of the choicest streams of flour of the group of mill streams that, if combined, would constitute the straight grade flour. "Grade" should refer to the type of flour as determined by the process of milling. In ordinary terminology, grades of American flour would be distinguished as patent, straight, first clear and second clear. Low grades and red dog

14. A Definition of the Term "Patent" Flour, Quick Action Questions, Northwestern Miller & Am. Baker **14**: 84 (July 7) 1937.

15. Dedrick, B. W.: "Patent Flour," Operative Miller **26**: 61, 1921.

16. Bailey, C. H.: The Chemistry of Wheat Flour, New York, The Chemical Catalog Company, 1925, p. 173.

should be regarded as feed grades "Class" of flour should refer to the market class of wheat from which the flour was milled, such as hard spring or durum.

Bleached Flour.—Because of consumers' preference for whiteness much of the white flour is bleached. Storing the flour for a period was the method formerly employed to whiten and mature flour. Millers now accomplish the same results and reduce storage expenses by bleaching the flour with chemical agents.

The following reagents are commonly used by millers for bleaching ("aging" or "improving") flour:

1. Nitrogen peroxide, generated by an electric discharge
2. Chlorine, usually containing a very small amount of nitrosyl chloride
3. Nitrogen trichloride
4. Organic peroxides, among which benzoyl peroxide has the most extensive use

The method of using these reagents varies. If the bleaching agent is a gas such as chlorine, nitrogen peroxide or nitrogen trichloride it is diluted by a large volume of air and blown into the agitators where the flour is treated. If the reagent is solid like benzoyl peroxide and its admixtures, it must be thoroughly mixed with the flour. This is accomplished by mechanical mixing methods of various kinds, with the object of obtaining a uniform distribution of the reagent through the flour.[17]

The various bleaching agents whiten flour by oxidizing the carotene normally present in wheat flour. The presence of carotene gives flour an "undesirable" yellow color.

Ferrari and Bailey[18] estimated the carotene spectrophotometrically in straight grade (whole meal) flours from a number of different samples of wheat and found values varying from 194 to 456 micrograms of carotene per hundred grams. The distribution of carotene was fairly uniform in the different parts of the grain, so that white flour did not contain much less than whole wheat flour. They also investigated the effect of bleaching on the carotene content of white flours and found that when flour was kept at room temperature the carotene content was reduced by 25 to 30 per cent in one hundred to one hundred and thirty days. Reduction was only slightly less when the flour was stored in carbon dioxide instead of air, but it was considerably less when the temperature was lowered to 0 C. The results of bleaching with chlorine, nitrogen trichloride and benzoyl peroxide were similar, only 25 per cent of the original carotene remained.

---

17. Bleaching of Flour, Queries and Minor Notes, J. A. M. A. **89**: 810 (Sept. 3), 1927.

18. Ferrari, C. G., and Bailey, C. H.: Effect of Storage and of Various Bleaching Agents on the Carotene Concentration of Flour, Cereal Chem. **6**: 457, 1929.

Differences of opinion exist as to whether or not bleaching affects the nutritive value of flour. Copping[19] postulated that in a poor diet, largely consisting of bread and lacking green vegetables and fats, bread made from unbleached flour may be a not unimportant source of vitamin A. If flour contains 200 to 400 micrograms of carotene per hundred grams and bread contains 66 per cent flour, 1 pound (454 Gm.) of bread made from unbleached flour would furnish approximately 0.6 to 1.2 mg. of carotene, so that a man eating 1 pound of bread daily might obtain a significant portion of his vitamin A requirements from this food alone.

The Council on Foods has accepted a number of brands of flour which are artificially bleached with nitrogen chloride and a mixture of calcium phosphate and benzoyl peroxide in the proportions of 1/10 ounce (2.8 Gm.) of nitrogen chloride to 196 pounds (88.9 Kg.) of flour and one part of the mixture of calcium phosphate and benzoyl peroxide to fifty thousand parts of flour. Two pounds (907 Gm.) of such flour would contain a maximum of 0.02 Gm. of benzoyl peroxide The Council requires that all accepted flours which are artificially bleached carry the word "Bleached" in a conspicuous position on the package label and publishes with each announcement of acceptance the amount and kind of bleaching agent used.

Phosphated Flour.—Phosphates in the form of monocalcium phosphate ($CaH_4[PO_4]_2.H_2O$) have long been added to flours sold in the South for making "hot biscuits." Flour with phosphate added is used in combination with sour milk, which provides lactic acid, and bicarbonate of soda. The latter is likely to be used in such excess as to require the presence of the added acid phosphate to give a mixture which is neutral or slightly acid in reaction. If the batter contains an excess of bicarbonate (which is partially converted into carbonate during baking), the resulting alkalinity imparts undesirable properties in terms of size, or volume, color and flavor of the biscuit.

The amount of monocalcium acid phosphate added to obviate these undesirable features is generally not more than 0.5 per cent. The presence of added phosphate must be declared on the label.

Composition of Accepted Wheat Flours.—The composition of accepted brands of white wheat flour is given in table 2. According to an analysis of data submitted by manufacturers of accepted brands of white flour the greatest variation in ash content occurred in flours milled from hard and soft wheat. It was shown that the ash content of hard wheat is greater than the ash content of soft wheat; the ash content of plain soft wheat flours varied from 0.3 to 0.4 per cent whereas that of hard wheat varied from 0.4 to 0.7 per cent. Whole wheat flour has an ash content of from 1.6 to 1.9 per cent. Hard wheat flours also contain more protein (N × 5.7) than soft wheat flours.

19. Copping, A. M.: The Nutritive Value of Wheaten Flour and Bread, Nutrition Abstr. & Rev. **8**: 555 (Jan.) 1939.

TABLE 2.—*Percentage Composition of Wheat Flours (Submitted by Manufacturers)*

	Moisture, %	Ash, %	Fat,* %	Protein,† %	Crude Fiber, %	Carbo-hydrates,‡ %	Number of Analytic Reports§
White flour—							
Soft wheat, plain	10.4-14.5	0.3-0.4	0.8-1.5	6.5- 9.8	0.1-0.5	73.4-80.3	20
Soft wheat, phosphate added	11.0-14.5	0.6-0.8	0.7-1.2	7.7- 9.5	0.2-0.5	75.8-79.3	8
Hard wheat, plain	9.6-15.0	0.4-0.7	1.5-2.0	9.8-13.8	0.1-0.7	68.8-76.8	65
Hard wheat, phosphate added	11.6-15.0	0.8-0.9	0.8-1.2	9.0-12.0	0.2 0.5	71.0-76.1	6
Blended soft and hard wheat, plain	12.0-15.0	0.4-0.5	0.5-1.3	9.0-12.0	0.1-0.3	70.9-76.9	8
Blended soft and hard wheat, phosphate added	12.0-14.0	0.5-0.8	0.8-1.6	9.0-11.0	0.2-0.5	72.5-76.5	4
Whole wheat flour—							
Hard wheat	11.1-14.5	1.6-1.9	1.6-2.8	10.5-16.0	1.8-2.9	64.1-71.7	9

* Ether extract.
† $N \times 5.7$.
‡ Other than crude fiber by difference.
§ Representing 179 brands of flour.

For example, the protein content of soft wheat flours varied from 6.5 to 9.8, whereas that of hard wheat flours ranged from 9.8 to 13.8 per cent and that of whole wheat flours from 10.5 to 16 per cent. The ash content of various extractions of soft wheat flours or of hard wheat flours was not significant.

Nutritive Value of Wheat Flours.—The proteins of wheat were thoroughly investigated by Osborne and Mendel,[20] who reported that the gliaden of wheat is lacking in certain amino acids which are essential for growth, reproduction and lactation in experimental animals which received no other source of protein. The human being lives on a mixed diet, so the amino acid deficiencies of some of the proteins of wheat are compensated for by the proteins of other foods, especially those of animal origin.

Mineral Constituents.—Most of the minerals in the wheat kernel are in the layers of bran. Removal of these layers produces appreciable reduction in the mineral content. The ash content is decreased two thirds from that of the original whole wheat in flour of 70 per cent extraction and four-fifths in flour of 40 per cent extraction. Copping[19] gave the following figures for the more important mineral constituents:

TABLE 3.—*Mineral Content of Wheat and Wheat Flour* *

Material	Calcium	Phosphorus	Potassium	Iron
Whole wheat	0.045	0.423	0.473	0.0050
Wheat bran	0.120	1.215	1.217	0.0078
Wheat germ	0.071	1.050	0.296	......
Whole wheat flour........	0.031	0.238	0.274	0.0025
Graham flour	0.039	0.364	0.457	0.0037
White flour	0.020	0.092	0.115	0.0010

* Values indicate grams per hundred grams.

The loss of iron in the milling of wheat is a matter of prime concern, since, as Rose[21] and others[22] have shown, the iron by the animal organism.

Vitamin Content.—Wheat flour may be considered devoid of vitamin C and vitamin D and, except for unbleached flours, of vitamin A. Different varieties of whole wheat contain from

20. (*a*) Osborne, T. B., Mendel, L. B., and Ferry, E. L.: The Role of Gliadin in Nutrition, J. Biol. Chem. **12**:473, 1912. (*b*) Mendel, L. B., and Fine, M.: Studies in Nutrition: The Utilization of the Proteins of Wheat, ibid **10**: 303, 1911. (*c*) Osborne, T. B., and Mendel, L. B.: The Nutritive Value of the Wheat Kernel and Its Milling Products, ibid. **37**: 557 (April) 1919.

21. Rose, M. S.; Vahlteich, E. M., and MacLeod, G.: Factors in Food Influencing Hemoglobin Regeneration: III. Eggs in Comparison with Whole Wheat, Prepared Bran, Oatmeal, Beef Liver and Beef Muscle, J. Biol. Chem. **104**: 217, 1934.

22. Free, A. H., and Bing, F. C.: Availability of Iron in Wheat. Proc. Soc. Exper. Biol. & Med. **35**: 453, (Dec.) 1936.

present in whole wheat is well utilized for nutritional iron needs

1.2 to 3.4 international units of vitamin B_1 per gram. The process of milling, however, reduces this fraction to a considerable degree. According to Copping and Roscoe,[23] the greatest loss of vitamin B_1 occurs in the fractions removed between the 82 and the 75 per cent extraction; with further refinement a steady decrease occurs, until at the 42 per cent extraction there is no detectable vitamin B_1 activity. A summary [24] of the vitamin B_1 content of wheat flour of different extractions as determined by several investigators is provided in table 4.

From these data it is obvious that the white flour produced at present does not contain as much vitamin B_1 as that produced before the invention of the modern rolling mill in 1870. According to Baker, Wright and Drummond,[25] flour obtained with the older milling processes (stone grinding) represented about 81 per cent of the original wheat kernel and contained on an average 1.65 international units of vitamin B_1 per gram, or about 62 per cent of the total vitamin present in the whole wheat grain. In contrast, modern white flour represents about 72 per cent of the kernel and has as little as 15 per cent of the vitamin originally contained in the cereal. In other words, the modern milling process gives a product with a vitamin B_1 content about one-fourth that of the old stone-ground flour. Such a change would not be of much practical importance if the products in question formed only a relatively small part of the diet. When, however, they furnish as much as 25 or more per cent of the total calories, this tremendous decrease in vitamin B_1 content becomes serious, especially when the other foods in the diet can not make up the deficiency. For a further discus-

TABLE 4.—*Vitamin B_1 Content of Wheat and of Bread*

Material	Vitamin B_1, International Units Per Gram
Whole wheat	1.86
Flour—	
Stone ground	1.6
94% extraction	1.2
75% extraction	0.4
70% extraction	0.37
60% extraction	0.24
42% extraction	0.00
Bread—	
Whole wheat	0.95
Brown	0.6
White	0.22

23. Copping, A. M., and Roscoe, M. H.: The Water Soluble B Vitamins in Yeast, Flour and Bread, Biochem. J. **31**: 1879, 1937.
24. Scheunert, A., and Schieblich, M.: Ueber den Vitamingehalt von Weizen und Roggen und der daraus hergestellten Mehle Brote, Biochem. Ztschr. **290**: 398, 1937.
25. Baker, A. Z.; Wright, M. D., and Drummond, J. C.: The Nutritive Value of Bread, J. Soc. Chem. Indust. **56**: 191, 1937.

sion of the problem of vitamin B_1 in nutrition, reference may be made to a report [26] of the Cooperative Committee on Vitamins.

The listed products of the following firms stand accepted:

Acme-Evans Company, Indianapolis.

EVAN'S E-Z BAKE BRAND FLOUR, white flour from hard and soft wheats; bleached.

WHITE PLUME BRAND CAKE FLOUR, white flour from soft winter wheat; bleached.

Bewley Mills, Fort Worth, Texas.

BEWLEY'S BRAND FLOUR, white flour from hard red winter wheat; bleached.

BEWLEY'S BRAND WHOLE WHEAT FLOUR, whole wheat flour from hard winter wheat.

Big Diamond Mills Company, Minneapolis. *See* Commander-Larabee Milling Company, Minneapolis.

Black Bros. Flour Mills, Beatrice, Neb.

SWEET TOOTH BRAND FLOUR, white flour from moderately hard winter wheat; bleached.

The Blair Milling Company, Atchison, Kan.

BLAIR'S BRAND FLOUR PHOSPHATE ADDED, white flour from hard winter wheat; bleached; 0.5 per cent monocalcium phosphate added.

BLAIR'S CERTIFIED NORTHERN TYPE BRAND FLOUR, white flour from hard winter wheat; bleached.

BLAIR'S CERTIFIED SOUTHERN TYPE BRAND FLOUR, white flour from hard winter wheat; bleached.

Blish Milling Company, Seymour, Ind.

COLONIAL BRAND FLOUR PHOSPHATE ADDED, white flour from soft wheat; bleached; 0.4 per cent calcium phosphate added

COLONIAL BRAND FLOUR, white flour from soft wheat; bleached.

Bob White Flour Mills, Kingfisher, Okla.

LIGHTNING BRAND FLOUR, white flour from hard wheat; bleached.

Breese Grain Co., Breese, Ill.

SENTRY BRAND WHOLE WHEAT FLOUR, whole wheat flour from hard winter wheat.

Burrus Mill & Elevator Co., Fort Worth, Texas.

LIGHT CRUST BRAND FLOUR, white flour from hard and soft wheat; bleached.

Climax Roller Mills, Shelbyville, Ky.

LONG'S CLIMAX BRAND FLOUR PHOSPHATE ADDED, white flour from soft winter wheat; bleached; 0.5 per cent calcium phosphate added.

LONG'S BRAND CAKE FLOUR PHOSPHATE ADDED, same as Long's Climax Brand Flour; Phosphate Added.

Collin County Mill & Elevator Co. Incorporated, McKinney, Texas.

MARECHAL NEIL BRAND FLOUR PHOSPHATE ADDED, white flour from hard and soft wheats; bleached; 0.5 per cent calcium phosphate added.

MARECHAL NEIL BRAND FLOUR, white flour from hard and soft wheats; bleached.

PEERLESS BRAND BAKER'S FLOUR, white flour from hard wheat; bleached.

WHITE BILLOW'S BRAND FLOUR PHOSPHATE ADDED, same as Marechal Neil Brand Flour; Phosphate Added.

WHITE BILLOW'S BRAND FLOUR, same as Marechal Neil Brand Flour.

---

26. The Status of Certain Questions Concerning Vitamins Based on Recommendation of the Cooperative Committee on Vitamins, report of the Council on Pharmacy and Chemistry and the Council on Foods, J. A. M. A. **113**: 589 (Aug.) 1939.

Commander-Larabee Milling Company, Minneapolis.

OLD DOMINION BRAND BAKER'S FLOUR, white flour from hard winter wheat; bleached.

SMITH'S BRAND FLOUR, white flour from hard winter wheat; bleached.

Product distributed by Big Diamond Mills Company, Minneapolis.

BIG DIAMOND BRAND FLOUR, white flour from hard spring wheat; bleached.

Product distributed by Commander Milling Company, Minneapolis.

COMMANDER BRAND FLOUR, same as Big Diamond Brand Flour.

MAPLESOTA BRAND FLOUR, white flour from hard spring wheat; bleached.

Products distributed by Empire Milling Company, Minneapolis.

BEST ON RECORD BRAND FLOUR, same as Big Diamond Brand Flour.

JERSEY LILY BRAND FLOUR, same as Maplesota Brand Flour.

Product distributed by Interior Flour Mills Company, Kansas City, Mo.

PERFECTION BRAND FLOUR, white flour from hard winter wheat; bleached.

Products distributed by Larabee Flour Mills Co., Kansas City, Mo.

AIRY FAIRY BRAND CAKE FLOUR, white flour from soft winter wheat, bleached.

EMPRESS BRAND FLOUR, white flour from hard winter wheat; bleached.

LARABEE'S AIRY FAIRY BRAND CAKE FLOUR, same as Airy Fairy Brand Cake Flour.

LARABEE'S BRAND FLOUR, white flour from hard winter wheat; bleached.

LARABEE'S CREAM LOAF BRAND BAKERS FLOUR, same as Old Dominion Brand Baker's Flour.

LARABEE'S DIXIE DREAM BRAND CAKE FLOUR, white flour from soft winter wheat; bleached.

LARABEE'S DIXIE DREAM BRAND CRACKER FLOUR, white flour from soft winter wheat; bleached.

LARABEE'S LITTLE PRINCESS BRAND CAKE FLOUR, patent flour milled from soft winter wheat; bleached.

Products distributed by Minneapolis Milling Company, Minneapolis.

MINNEAPOLIS BRAND FLOUR, same as Big Diamond Brand Flour.

TOPS-ALL BRAND BAKER'S FLOUR, white flours from hard spring wheat; bleached.

Products distributed by Monarch Milling Company, Kansas City.

QUEEN OF KANSAS BRAND FLOUR, same as Perfection Brand Flour.

KING OF KANSAS BRAND BAKER'S FLOUR, same as Old Dominion Brand Baker's Flour.

Product distributed by Northland Milling Company, Minneapolis.

THE GREAT MADELIA'S BRAND FLOUR, same as Maplesota Brand Flour.

Products distributed by Stokes Milling Company, Minneapolis.

GARLAND BRAND FLOUR, same as Maplesota Brand Flour.

SUNSHINE BRAND FLOUR, same as Big Diamond Brand Flour.

The Concordia Milling Company, Concordia, Kan.

P.P.P. BRAND FLOUR, white flour from hard winter wheat; bleached.

P.P.P. BRAND FLOUR, white flour from hard winter wheat; not bleached.

Crown Mills, Portland, Ore.

CROWN BRAND FLOUR, white flour from blended hard wheats; not bleached.

CROWN BRAND CAKE FLOUR, white flour from blended soft wheats; bleached.

The Dorsel Company, Incorporated, Newport, Ky.

DORSEL'S SEAL OF KENTUCKY BRAND FLOUR PHOSPHATE ADDED, white flour from blended hard and soft winter wheats; bleached; 0.4 per cent calcium phosphate added.

Empire Milling Company, Minneapolis. *See* Commander-Larabee Milling Company, Minneapolis.

Fant Milling Company, Sherman, Texas.

BLUEBELL BRAND FLOUR, white flour from hard wheat; bleached.

FANT'S BRAND FLOUR, white flour from hard wheat; bleached.

FANT'S FAIRY BRAND FLOUR, white flour from blended soft and hard wheats; bleached.

FANT'S FAIRY BRAND FLOUR PHOSPHATE ADDED, white flour from blended soft and hard wheats; bleached; 0.5 per cent calcium phosphate added.

FANT'S FAIRY BRAND FLOUR, same as Bluebell Brand Flour.

FANT MILLING COMPANY BRAND WHOLE WHEAT FLOUR, whole wheat flour milled from hard winter wheat.

GLADIOLA BRAND FLOUR, same as Fant's Fairy Brand Flour.

GLADIOLA BRAND FLOUR PHOSPHATE ADDED, same as Fant's Fairy Brand Flour Phosphate Added.

GLADIOLA BRAND FLOUR, same as Bluebell Brand Flour.

RED ELEPHANT BRAND FLOUR, white flour from hard wheat; bleached.

X-CEL BRAND FLOUR, white flour from blended hard and soft wheats; bleached.

Federal Mill, Inc., Lockport, N. Y.

BLUE RIBBON BRAND BREAD FLOUR, white flour from blended spring and winter hard wheats; bleached.

CAKE-MAKER BRAND FLOUR, white flour from soft winter wheat; bleached.

DAILY BREAD BRAND FLOUR, white flour from blended spring and winter hard wheat; bleached.

DAIRY MAID ALL-ROUND BRAND FLOUR, white flour from soft winter wheats; bleached.

DIAMOND W. BRAND FLOUR, same as Dairy Maid All-Round Brand Flour.

FOUR LEAF CLOVER BRAND BREAD FLOUR, white flour from blended spring and winter hard wheats; bleached.

GLOBE BRAND FLOUR, white flour from soft winter wheat; bleached.

HIGH QUALITY A BRAND FLOUR, white flour from hard winter wheat; bleached.

LASSIE BRAND FLOUR, white flour from hard winter wheat; bleached.

LUCKY BRAND BREAD FLOUR, same as Blue Ribbon Brand Bread Flour

LUCKY BREAD BRAND GRAHAM FLOUR, whole wheat flour from hard spring wheat with moderately fine bran.

LUCKY WHOLE OF THE WHEAT BRAND FLOUR, whole wheat flour from hard spring wheat with moderately fine bran.

MAINE'S IDEAL BRAND FLOUR, same as Dairy Maid All-Round Brand Flour.

MOHAWK BRAND BREAD FLOUR, same as Blue Ribbon Brand Bread Flour.

PURPLE CROSS ALL-ROUND BRAND FLOUR, same as Dairy Maid All-Round Brand Flour.

ROYAL LILLY BRAND FLOUR, same as Dairy Maid All-Round Brand Flour.

SILVER SPRAY BRAND FLOUR, same as Globe Brand Flour.

SNOW DROP BRAND FLOUR, same as Globe Brand Flour.

SPHINX BRAND FLOUR, same as Four Leaf Clover Brand Flour.

SUNBONNET BRAND FLOUR, same as Lassie Brand Flour.

Fisher Flouring Mills Co. Incorporated, Seattle.

FISHER'S BRAND CAKE FLOUR, white flour from red and white soft wheats; bleached.

FISHER'S BLEND BRAND FLOUR, white flour from red and white hard wheats; bleached.

FISHER'S BRAND COARSE GRAHAM FLOUR, coarse whole wheat flour milled from blended red and white hard wheats.

FISHER'S BRAND WHOLE WHEAT FLOUR, fine whole wheat flour milled from blended hard red wheats.

General Mills, Inc., Minneapolis.

CROSBY'S BRAND BAKER'S FLOUR, white flour from hard winter wheat; bleached.

GOLD MEDAL MONEY MAKER BRAND BAKER'S FLOUR, same as Crosby's Brand Baker's Flour.

GOLD MEDAL "KITCHEN TESTED" BRAND FLOUR PHOSPHATE ADDED, white flour from hard wheat; bleached; 0.5 per cent calcium phosphate added.

KING WHEAT BRAND BAKER'S FLOUR, same as Crosby's Brand Baker's Flour.

WASHBURN'S GOLD MEDAL BRAND BAKER'S FLOUR, white flour from hard spring wheats; bleached

WASHBURN'S GOLD MEDAL "KITCHEN-TESTED" BRAND FLOUR, white flour from hard wheat; bleached.

SOFTASILK BRAND CAKE FLOUR, white flour from soft wheat; bleached

Product distributed by Kell Mill & Elevator Company, Wichita Falls, Texas.

CARNATION BRAND FLOUR, same as Washburn's Gold Medal "Kitchen Tested" Brand Flour.

Product distributed by Oklahoma City Mill & Elevator Company, Oklahoma City.

HELIOTROPE BRAND FLOUR, white flour from blended hard and soft wheats; bleached.

Product distributed by The Red Star Milling Company, Wichita, Kan.

RED STAR BRAND FLOUR, same as Washburn's Gold Medal "Kitchen Tested" Brand Flour.

Product distributed by Royal Milling Company, Minneapolis.

RED DEPENDABLE BRAND FLOUR, same as Washburn's Gold Medal "Kitchen Tested" Brand Flour.

Product distributed by Sperry Flour Company, San Francisco.

SPERRY DRIFTED SNOW BRAND FLOUR, same as Washburn's Gold Medal "Kitchen-Tested" Brand Flour.

Gilster Milling Company, Chester, Ill.

GILSTER'S BRAND FLOUR, white flour from soft winter wheat; bleached

GILSTER'S BRAND FLOUR PHOSPHATE ADDED, white flour from soft winter wheat; bleached; 0.5 per cent calcium phosphate added.

GILSTER'S FEATHERLITE BRAND FLOUR, white flour from blended soft winter wheats; bleached.

GILSTER'S FEATHERLITE BRAND FLOUR PHOSPHATE ADDED, white flour from blended soft winter wheats; bleached; 0.5 per cent calcium phosphate added.

GILSTER'S MOTHER'S JOY BRAND FLOUR PHOSPHATE ADDED, same as Gilster's Featherlite Brand Flour Phosphate Added.

GILSTER'S FEATHERLITE BRAND CAKE FLOUR, same as Gilster's Brand Flour.

Interior Flour Mills Company, Kansas City, Mo. *See* Commander-Larabee Milling Company, Minneapolis.

The Ismert-Hincke Milling Co., Kansas City, Mo.

DAY STAR BRAND FLOUR, white flour from hard winter wheat; bleached.

I. H. BRAND FLOUR, same as Day Star Brand Flour.

SPLIT SILK BRAND FLOUR, white flour from hard winter wheat; bleached.

THUNDERBOLT BRAND FLOUR, white flour from hard winter wheat; bleached.

Kell Mill & Elevator Company, Wichita Falls, Texas. *See* General Mills, Inc., Minneapolis.

Lawrenceburg Roller Mills Co., Lawrenceburg, Ind.

TOWN TALK BRAND FLOUR, white flour from hard winter wheat; bleached.

Lexington Roller Mills Co., Incorporated, Lexington, Ky.

CREAM ROLLER BRAND FLOUR PHOSPHATE ADDED, white flour from soft winter wheat; bleached; 0 5 per cent calcium phosphate added.

HENRY CLAY ROLLER BRAND FLOUR PHOSPHATE ADDED, same as Cream Roller Brand Flour Phosphate Added.

J. E. M. BRAND FLOUR PHOSPHATE ADDED, same as Cream Roller Brand Flour Phosphate Added.

Larabee Flour Mills Co., Kansas City, Mo. *See* Commander-Larabee Milling Company, Minneapolis.

Liberty Mills, San Antonio, Texas.

BAKEBEST BAKER'S BRAND FLOUR, white flour from hard red winter wheat; bleached.

BAKER'S BRAND FLOUR, white flour from hard winter wheat; bleached

CRAFTSMAN BRAND BAKER'S FLOUR, same as Baker's Brand Flour.

LA CAMPANA BRAND FLOUR, white flour from hard winter wheat; bleached.

MELLO LOAF BRAND BAKER'S FLOUR, same as La Campana Brand Flour.

ROSE OF TEXAS BRAND FLOUR, white flour milled from hard red winter wheat; bleached.

ROYAL BRAND FLOUR, same as Rose of Texas Brand Flour.

SIN-RIVAL BRAND FLOUR, same as La Campana Brand Flour.

VICTOR BRAND FLOUR, same as La Campana Brand Flour.

The Light Grain & Milling Company, Liberal, Kan.

LIGHT'S FAIRY QUEEN BRAND CAKE FLOUR, white flour from hard winter wheat; bleached.

LIGHT'S OVEN BRAND FLOUR PHOSPHATE ADDED, white flour from hard winter wheat; bleached; 0.5 per cent calcium phosphate added

LIGHT'S OVEN BRAND FLOUR, white flour from hard winter wheat; bleached.

Minneapolis Milling Company, Minneapolis. *See* Commander-Larabee Milling Company, Minneapolis.

Minot Flour Mill Co., Incorporated, Minot, N. D.

SNOW WHITE BRAND FLOUR, white flour from hard spring wheat; bleached.

Monarch Milling Company, Kansas City, Mo. *See* Commander-Larabee Milling Company, Minneapolis.

Morten Milling Company, Dallas, Texas.

LA FRANCE BRAND FLOUR, white flour from hard and soft red winter wheat; bleached.

The New Era Milling Co., Arkansas City, Kan.

POLAR BEAR BRAND FLOUR, white flour from hard winter wheat; bleached.

Noblesville Milling Co., Noblesville, Ind.

DIADEM BRAND FLOUR, white flour from soft winter wheat; bleached.

KISMET BRAND CAKE FLOUR, white flour from soft winter wheat; bleached.

KISMET BRAND FLOUR, same as Diadem Brand Flour.

Northland Milling Company, Minneapolis. *See* Commander-Larabee Milling Company, Minneapolis.

Oklahoma City Mill & Elevator Company, Oklahoma City. *See* General Mills, Inc., Minneapolis.

Pillsbury Flour Mills Company, Minneapolis.

PILLSBURY'S XXXX BRAND FLOUR, white flour from blended hard wheats; bleached.

The Red Star Milling Company, Wichita, Kan. *See* General Mills, Inc., Minneapolis.

The Robinson Milling Company, Salina, Kan.

BETTY JANE BRAND FLOUR, white flour from hard winter wheat; bleached.

BETTY JANE BRAND FLOUR PHOSPHATE ADDED, white flour from hard winter wheat; bleached; 0.5 per cent calcium phosphate added.

CERTI-TEST BRAND FLOUR, white flour from hard winter wheat; bleached.

MARY LOU BRAND FLOUR, white flour from hard winter wheat; bleached.

MARY LOU BRAND FLOUR PHOSPHATE ADDED, white flour from hard winter wheat; bleached; 0.5 per cent calcium phosphate added.

OVEN CRAFT BRAND FLOUR, white flour from hard winter wheat; bleached

PERFECTION BRAND FLOUR, white flour from hard winter wheat; bleached.

ROBIN'S BRAND FLOUR, same as Betty Jane Brand Flour.

ROBIN'S BRAND FLOUR PHOSPHATE ADDED, same as Betty Jane Brand Flour Phosphate Added.

Royal Milling Company, Minneapolis. *See* General Mills, Inc., Minneapolis.

Russell-Miller Milling Co., Minneapolis.

OCCIDENT BRAND FLOUR, white flour from hard wheat; bleached.

OCCIDENT BRAND FLOUR, white flour from hard wheat; not bleached.

Sands, Taylor & Wood Co., Boston.

KING ARTHUR NEVER BLEACHED BRAND FLOUR, white flour from hard spring wheat.

Saxony Mills, St. Louis.

ARBITRATOR BRAND FLOUR, white flour from soft winter wheat; bleached.

ARBITRATOR BRAND FLOUR PHOSPHATE ADDED, white flour from soft winter wheat; bleached; 0.5 per cent calcium phosphate added.

I X L BRAND FLOUR, white flour from hard winter wheat bleached.

I X L BRAND BAKER'S FLOUR, white flour from hard winter wheat; bleached; 0.2 per cent malted wheat flour added.

JUST RIGHT BRAND FLOUR, white flour from hard wheat; bleached.

JUST RIGHT BRAND FLOUR PHOSPHATE ADDED, white flour from hard wheat; bleached; 0.5 per cent calcium phosphate added.

SAXONY BRAND FLOUR, white flour from soft red winter wheat; bleached.

SAXONY BRAND FLOUR PHOSPHATE ADDED, white flour from soft red winter wheat; bleached; 0.5 per cent calcium phosphate added.

SOUTHERN BELLE BRAND FLOUR, same as Saxony Brand Flour.

SOUTHERN BELLE BRAND FLOUR PHOSPHATE ADDED, same as Saxony Brand Flour Phosphate Added.

Scott County Milling Company, Sikeston, Mo.

JUANITA BRAND CAKE FLOUR, white flour from soft winter wheat; bleached.

JUANITA BRAND CAKE FLOUR PHOSPHATE ADDED, white flour from soft winter wheat; bleached; 0.5 per cent calcium phosphate added.

WHITE RIBBON BRAND FLOUR PHOSPHATE ADDED, white flour from soft and hard red winter wheat; bleached; 0.5 per cent calcium phosphate added.

Slater Mill & Elevator Co., Slater, Mo.

HUMMER BRAND FLOUR, white flour from soft red wheat; bleached.

MENU BRAND FLOUR, same as Hummer Brand Flour.

Sperry Flour Company, San Francisco. *See* General Mills, Inc., Minneapolis.

State Mill and Elevator, Grand Forks, N. D.

DAKOTA MAID BRAND FLOUR, white flour from hard spring wheat; bleached.

Stokes Milling Company, Minneapolis. *See* Commander-Larabee Milling Company, Minneapolis.

Texas Star Flour Mills, Galveston, Texas.

AMAESSA BRAND FLOUR, white flour from hard winter wheat; not bleached.

AMBROSIA BRAND FLOUR, white flour from hard wheat; bleached.

AMBROSIA BRAND BAKER'S FLOUR, same as Ambrosia Brand Flour.

ANITA BRAND FLOUR, white flour from hard winter wheat; bleached.

ANITA HIGH PROTEIN BRAND FLOUR, white flour from hard winter wheat; bleached.

ANITA HIGH PROTEIN BRAND FLOUR, white flour from hard winter wheat; not bleached.

CAPITANA BRAND FLOUR, white flour from hard red winter wheat; bleached.

ESTRELLA BRAND FLOUR, same as Anita High Protein Brand Flour, bleached.

ESTRELLA BRAND FLOUR, same as Anita High Protein Flour, not bleached.

NEW WAY BRAND FLOUR, white flour from hard winter wheat; bleached

TIDAL WAVE BRAND FLOUR, white flour from hard winter wheat; bleached.

TIDAL WAVE BRAND BAKER'S FLOUR, same as Tidal Wave Brand Flour

Tri-State Milling Co., Rapid City, S. D.

TRISCO BRAND FLOUR, white flour from hard spring wheat; bleached.

Universal Mills, Fort Worth, Texas.

GOLD CHAIN BRAND FLOUR, white flour from blended hard and soft winter wheats; bleached

GOLD CHAIN BRAND WHOLE WHEAT FLOUR, whole wheat flour milled from hard wheat.

RED CHAIN BRAND WHOLE WHEAT FLOUR, same as Gold Chain Brand Whole Wheat Flour

UNIVERSAL BRAND BAKER'S FLOUR, white flour from hard winter wheat; bleached.

The following firms distribute under their own labels flours purchased from manufacturers of accepted products now privileged to use the Seal of Acceptance. The labels and advertising conform to the Rules and Decisions of the Council.

Farmers Wholesale Company, Minneapolis.

COUNTRY GENTLEMEN BRAND FLOUR, white flour from hard winter wheat; bleached.

FARMER BOY BRAND FLOUR, white flour from hard winter wheat; bleached.

Nash Finch Company, Minneapolis.

OUR FAMILY BRAND FLOUR, white flour from hard winter wheat; bleached.

Slocum Bergren Company, Minneapolis.

RED AND WHITE BRAND FLOUR, white flour from hard winter wheat; bleached.

Bread

Most of the wheat flour milled in this country is made into bread for human consumption. In 1938 about eight billion loaves of bread were baked for commercial distribution. Most of the bread purchased in the United States is white.[27]

Rules and Regulations Regarding Bread.—According to federal definition, bread is the product made by baking a dough consisting of a leavened or unleavened mixture of ground grain, other edible farinaceous substances or both with potable water, with or without the addition of other substances.

White bread is the product obtained by baking a leavened and kneaded mixture of flour, water, salt and yeast, with or without edible fat or oil, milk or milk product and sugar or other fermentable carbohydrate substance or both. It may also contain yeast nutrients such as salts of calcium and other minerals.

Whole wheat bread, (entire wheat bread and graham bread) must contain whole wheat flour in place of the white flour, but the other ingredients, including yeast nutrients such as salts of calcium and other minerals, are identical with those in white bread.

Milk bread must contain milk or its equivalent (milk solids and water in the proportions of average milk) as the only liquid ingredient in order to conform to federal standards.

The usual loaf of rye bread is a mixture of rye and wheat flours, sometimes with more than half wheat. Only a small amount of bread, usually known as pumpernickel, is made of 100 per cent rye flour or meal. Special directions must be followed to obtain a satisfactory all-rye bread, which is useful for patients allergic to wheat. Unfortunately, at present there are no federal standards for rye bread, and bread sold as rye bread may contain from 2 to 100 per cent rye flour.

State and local regulations touch on the weight of bread. In general, these laws are of two kinds: (1) those requiring that only loaves of certain specified weights be sold (for example, ½ pound, ¾ pound, 1 pound, 1½ pounds and 2 pounds), and (2) those requiring that bread be labeled with its weight. New Jersey requires that all bread must be sold by weight, and this weight must be specified if the consumer requires it. Pennsylvania has a somewhat similar law which specifies, in addition, that scales must be provided at all selling points. Seven states delegate the matter of bread weights entirely to the city councils. Fifteen states are entirely without bread weight laws.

Ingredients of Bread.—Flour makes up about 57 per cent of the weight of a loaf of bread. Other starchy substances such as corn starch or the starch from potatoes, barley, rice or oats are sometimes incorporated in bread, corn starch being

---

27. Stiebeling, H. K., and Phipard, E. F.: Diets of Families of Employed Wage Earners and Clerical Workers in Cities. Circular 507, United States Department of Agriculture, Jan. 1939.

the most commonly used. The federal standard specifies that white bread, milk bread and raisin bread may include not more than 3 per cent of other edible farinaceous substances and that raisin bread must contain not less than 3 ounces of raisins to the pound.

A freshly baked loaf of bread contains about 38 per cent moisture. On standing the moisture content gradually becomes less, and in air-dried bread, it may be about 10 to 15 per cent. While the liquid used in making the dough is commonly water for French, Vienna, and whole wheat breads, milk, or milk solids and water in the proportions of average milk, must be used for milk bread. It is common practice now for bakers to use some dried skimmed milk in the formulas of ordinary white bread. When milk or skimmed milk is used in preparing the dough the resulting bread has enhanced nutritional value.

Yeast is used as the leavening in all commercial breads. Yeast foods, or yeast extenders, are now much more generally used than they were ten or more years ago. These are usually calcium and phosphorus salts, which increase the activity of yeast, thus hastening the process of fermentation and enabling the baker to use less yeast. The amounts and kinds of yeast foods used vary with the formula.

In addition to yeast and yeast food, commercial bakers' bread contains substances known as bread improvers. They are added to the dough, increasing the facility of the flour for absorbing moisture, making it possible to obtain more loaves from a barrel of flour. It is claimed for some improvers that they will increase the number of loaves as much as 10 per cent as well as improve the flavor and texture of the bread. Most bread improvers are patented products, the chief ingredients of which are calcium salts. Some European countries prohibit their use. Bread improvers which act primarily as yeast nutrients are permitted in the definition and standard for white bread of the Food and Drug Administration.

Sweetening agents, when present, may be sucrose, malt or a combination of both. Some malt is used because it turns some of the starch in the flour into sugar for yeast to feed on, thus increasing the volume of the bread.

Vegetable shortening is used in most breads, but lard, butter or both are also used. The kind of shortening, unless it is butter, is of little importance nutritionally.

Composition of Bread.—According to federal standards the moisture content of bread may not exceed 38 per cent. Breads containing milk may be expected to have a slightly higher ash content than bread made without milk. Whole wheat bread contains more ash than white bread. It also has more crude fiber. White bread furnishes from 70 to 80 calories to the ounce and whole wheat bread from 68 to 85 calories to the ounce. The range in composition of breads formerly accepted by the Council on Foods is given in table 5. The analysis of each bread was submitted by the manufacturer.

Table 5.—*Composition of Breads Formerly Accepted (Submitted by Manufacturer)*

	Number of Brands	Number of Analyses	Moisture, %	Ash, %	Fat,* %	Protein,† %	Crude Fiber, %	Carbo-hydrates,‡ %	Calories Per Gm.	Calories Per Oz.
White bread—										
Milk bread	5	5	32.5-38.0	0.7-2.2	2.1-3.7§	8.4-13.5	0.1-0.4	45.1-50.0	2.5-2.8	71-80
Bread, containing skimmed milk solids equivalent to fresh skimmed milk as only liquid ingredient..................	7	5	34.0-37.5	0.9-2.1	1.1-3.5	9.1-10.2	0.2	47.2-54.0	2.6	74
Bread, containing skimmed milk solids equivalent to a half or more of total liquid as fresh skimmed milk...... .	60	36	31.9-38.3	0.7-2.2	0.8-3.5	8.3-12.0	0.1-0.5	46.7-55.8	2.5-2.8	71-80
Bread, containing skimmed milk solids equivalent to less than half of total liquid as fresh skimmed milk....	50	31	33.0-38.0	0.8-2.3	0.6-3.5	8.8-10.4	0.1-0.5	47.7-55.0	2.5-2.7	71-77
Bread, containing no milk................	3	3	31.1-36.8	0.6-0.7	1.2-1.5	8.4-9.8	0.2-0.3	52.8-56.3	2.6-2.8	74-80
Whole wheat bread......	9	6	34.3-38.0	1.6-2.5	2.0-6.1	9.9-11.0	1.2-2.0	41.2-48.7	2.4-3.0	68-85
Whole wheat and white bread..	10	9	34.0-37.0	1.1-2.2	1.2-4.0§	10.0-11.9	0.5-1.4	44.4-51.7	2.2-3.3	62-94
Rye bread	4	3	35.6-36.8	1.0-1.9	1.5-3.0§	9.2-10.4	0.5-0.9	49.4-50.2	2.5-2.6	71-74

* Ether extract.
† N × 6.25.
‡ Other than crude fiber (by difference).
§ The method of determining the fat was not reported.

Nutritive Value of Bread.—The four most important considerations in evaluating the nutritive qualities of a foodstuff are vitamin content, mineral content, protein content and caloric value.

Vitamin Content: The vitamin content of bread depends on the vitamin content of the flour from which it is made. Most of the vitamins contained in a kernel of wheat reside in the wheat germ and the bran, which are removed in the process of making white flour. Removal of these parts of the kernel increases the keeping qualities of the flour but renders negligible the vitamin content.

Although the wheat berry is a good source of vitamin B_1, modern white flour represents only 72 per cent of the grain and has as low as 15 per cent of the amount of vitamin B_1 originally contained in the grain. This tremendous decrease in vitamin B_1 content may be serious when white bread is used instead of whole wheat bread in the diet and no special way is provided of replacing the vitamin thus lost.

Copping[28] reported that even with the water replaced by fluid milk in the formula white bread will have only about 12 to 30 international units of vitamin B_1 per hundred grams. Whole wheat bread contains from 75 to 130 international units of vitamin B_1 per hundred grams. Although yeast is a rich source of several vitamins of the B complex, the amount of yeast in bread is too small to affect the total vitamin content appreciably.

According to Morgan and Frederick[28] practically no loss of vitamin B_1 occurs in the ordinary loaf during the baking process at an oven temperature of 350 to 446 F. (177 to 230 C.): 1½ pound loaves retain slightly more vitamin B_1 than 1 pound loaves. Bread sold as milk bread has about the same vitamin B_1 content as white bread. The crust of whole wheat bread is lower in vitamin B_1 than the crumb, the maximum lowering being about 35 per cent.

Cereal grains are less rich in vitamin G (riboflavin) than vitamin B_1. Whole wheat has from 80 to 100 Sherman-Bourquin units of vitamin G per hundred grams and wheat germ from 200 to 400 units. The amount in white flour is small and is decreased by bleaching. When skimmed milk is used in making bread the vitamin G content is somewhat increased, but no systematic studies of riboflavin in breads have as yet been reported.

Mineral Content: Most of the minerals in the wheat kernel are in the layers of bran. Removal of these layers produces a two-thirds decrease in the mineral content from that of the original whole wheat in flour of 70 per cent extraction and a four-fifths decrease in flour of 40 per cent extraction.

The loss of iron in the milling of wheat is a matter of some importance, since it has been shown that the iron present in

28. Morgan, A. F., and Frederick, H.: Vitamin B (B_1) in Bread as Affected by Baking. Cereal Chem. 12: 390 (July) 1935.

whole wheat meal is particularly well absorbed by the animal organism and is important for formation of hemoglobin.[28] White bread is low in iron, whereas, whole wheat bread is a good source of iron.[29] Rye bread contains more copper and iron than white bread but less than whole wheat bread.

The more common use of dried skimmed milk in the preparation of dough for baking bread has led to a considerable increase in the amount of calcium provided by this food. There is a trace of calcium in flour, there may be a larger amount in the yeast food, but the greatest proportion is derived from the skimmed milk solids. To show the importance of skimmed milk as a source of calcium it may be calculated that on a basis of a dried bread containing 2 per cent skimmed milk solids, 6 per cent of the total calcium would be derived from the flour, 9 per cent from the yeast food, and 85 per cent from the skimmed milk solids, and with higher amounts of skimmed milk the proportion of calcium furnished by the skimmed milk would be higher. A recent study[30] of the calcium content of commercial white bread shows that a pound loaf contains an average of 0.08 per cent calcium on the basis of 38 per cent moisture. Formerly the usual commercial loaf of white bread as purchased provided only about 0.031 per cent calcium[31] (probably containing about 35 per cent moisture).

Protein Content: The proteins of bread, whether white, whole wheat or rye, constitute from 8 to 12 per cent of the total weight on the basis of 31 to 38 per cent moisture, and the protein calories furnish about the proportion of the total calories commonly found in an ordinary mixed diet. Hence, while the amount of protein in an ounce of bread is not significant, the consumption of ¼ pound or more of bread every day means the regular intake of at least one tenth of the adult's daily protein requirement as bread protein. Sherman[32] and Rose, MacLeod and Bisbey[33] have shown that the proteins of bread are well utilized by human beings.

Fairbanks,[34] in reporting feeding experiments on rats, pointed out that the protein of bread is enhanced by milk to its optimum for growth when the bread contains 6 per cent of milk solids.

In a study of the proportion of protein furnished by the liquid ingredient in 75 formulas for breads formerly accepted by the Council, it was estimated that in breads containing about

29. Myers, V. C.; Remp, D. G., and Bing, F. C.: Hemoglobin Production in Rats on Diets Containing Bread, Cereal Chem. **12**: 372 (July) 1935.

30. Prouty, W. W. and Cathcart, W. H.: The Calcium Content of White Bread, J. Nutrition **18**: 217 (Sept.) 1939.

31. Sherman, H. C.: Chemistry of Foods and Nutrition, ed. 5, New York, The Macmillan Company, 1937.

32. Sherman, H. C.: Protein Requirement of Maintenance in Man and the Nutritive Efficiency of Bread Protein, J. Biol. Chem. **41**: 97, 1920.

33. Rose, M. S.; MacLeod, G., and Bisbey, G.: Maintenance Values for the Proteins of Milk, Bread-and-Milk, Meat and Soybean Curd in Human Nutrition, Proc. Soc. Exper. Biol. & Med. **21**: 143, 1923.

34. Fairbanks, B. W.: Improving the Nutritive Value of Bread by the Addition of Dry Milk Solids, Cereal Chem. **15**: 169, 1938.

7 per cent of the flour as dried skimmed milk, the milk proteins accounted for about 16 per cent of the total protein of the bread.

Caloric Value: As a source of calories, bread is one of the most economical staples in the diet. Its convenience, bland flavor and ready digestibility, combined with its low price, give it an important place in most households. A pound loaf will furnish approximately 1,200 calories Some mention may be made of the unfortunate practice which many persons have of reducing weight by dietary restrictions without the advice of a competent physician. Bread is often eliminated from the diet for reducing purposes.

The newer knowledge of nutrition has shown that when a reduction in calories is to be made, one should diminish consumption of foods which supply relatively large proportions of calories in comparison with minerals and vitamins. The decrease should not fall wholly on bread and other grain products but should be shared by sugar and fats. Omission or considerable reduction of vitamin A-bearing fats necessitates the provision of sufficient amounts of vitamin A from sources low in calories, such as green vegetables, fish liver oils or other forms of vitamin A.

Conclusion.—Bread is a wholesome food that provides calories at a comparatively low cost. When it is regularly consumed in considerable amounts it supplies an amount of protein which is significant in the diet. The proteins of bread are efficiently utilized but should be supplemented by other proteins of the diet, especially those of milk, eggs, meat or fish. White bread may be rated also as a fair source of calcium, phosphorus and iron and a good source of calories.

Self-Rising Flours and Mixes

Self-Rising Flour. — Self-rising flours are mixes so compounded that they require no additional leavening agent when used in the preparation of biscuits and pastry. The products available on the market show considerable variation in relative proportions of different ingredients.

The flour used in the preparation of self-rising flour may be milled from hard or soft wheat or from both. Various extractions of flours may be used.

The bleached or unbleached flour is thoroughly mixed in a batch mixer with definite proportions of sodium chloride, sodium bicarbonate and an acidifying salt such as calcium phosphate ($CaH_4[PO_4]_2.H_2O$), sodium pyrophosphate ($Na_4P_2O_7.10H_2O$) or potassium tartrate ($K_2C_4H_4O_6.\frac{1}{2}H_2O$); the resulting self-rising flour is packed in cartons by automatic filling machines.

Pancake Flours.—Pancake flours consist of wheat or wheat flour plus two or more of the following flours: rye, corn, rice, soya and buckwheat. To this mixture are added definite proportions of a sugar (usually dextrose), sodium chloride, sodium bicarbonate and an acidifying salt such as calcium phosphate

($CaH_4[PO_4]_2.H_2O$), sodium pyrophosphate ($Na_4P_2O_7.10H_2O$) or sodium aluminum sulfate ($NaAl[SO_4]_2$) or a combination of acid salts. Dried skimmed milk may be present or absent. The amounts of dried skimmed milk range from 5 to 30 per cent of the formula. The ingredients are thoroughly mixed in a batch mixer and automatically packed in cartons.

Pancake flours are convenient for their purpose because for use they require only the addition of liquid, either water or milk, according to the directions printed on each package.

Biscuit Mixes.—Biscuit mixes are prepared from wheat flour milled from hard or soft wheat or from both. Bleached flour is used in all of the accepted brands of biscuit mixes. The flour is combined with definite proportions of hydrogenated vegetable fat, usually cottonseed oil, peanut oil or sesame oil, dried skimmed milk, sugar, sucrose or dextrose, sodium chloride, sodium bicarbonate and an acid salt such as calcium phosphate ($CaH_4[PO_4]_2.H_2O$), sodium pyrophosphate ($Na_4P_2O_7.10H_2O$) or both.

For use biscuit mixes require only the addition of water for the preparation of the dough.

Gingerbread mix differs from biscuit mix in that it contains more sugar, fat and dried milk as well as ginger spice. It is packaged in amounts sufficient to make one gingerbread cake. The preparation of gingerbread requires only the addition of liquid, either milk or water.

The percentage composition of self-rising flours and mixes is given in table 6.

The listed products of the following firms stand accepted:

Allied Mills, Inc., Chicago, product distributed by Kreemex Cereal Division, Greenville, Ohio .

KREEMEX BRAND BUCKWHEAT AND WHEAT PANCAKE FLOUR, containing buckwheat flour, standard patent flour milled from soft wheat, soya flour, dextrose, corn starch, calcium phosphate ($CaH_4[PO_4]_2.H_2O$), sodium chloride and sodium bicarbonate.

KREEMEX BRAND PANCAKE FLOUR, containing standard patent flour milled from soft wheat, soya flour, corn flour, dextrose, dried skimmed milk, corn starch, sodium chloride, calcium phosphate ($CaH_4[PO_4]_2.H_2O$) and sodium bicarbonate.

The American Products Co., Cincinnati, product distributed by The Zanol Products Co., Cincinnati.

EZEMADE BRAND BISCUIT MIX, containing patent flour milled from hard wheat (bleached), vegetable fat, sucrose, dried skimmed milk, sodium pyrophosphate ($Na_4P_2O_7.10H_2O$), sodium chloride, sodium bicarbonate and calcium phosphate ($CaH_4[PO_4]_2.H_2O$).

Black Bros. Flour Mills, Beatrice, Neb.

SWEET TOOTH BRAND BUCKWHEAT PANCAKE FLOUR, containing buckwheat flour, first clear patent wheat flour, white corn flour, calcium phosphate ($CaH_4[PO_4]_2.H_2O$), sodium bicarbonate, sodium chloride, dextrose and dried skimmed milk.

SWEET TOOTH BRAND PANCAKE FLOUR, containing first clear patent wheat flour, white corn flour, rye flour, calcium phosphate ($CaH_4[PO_4]_2.H_2O$), sodium chloride, sodium bicarbonate, dextrose and dried skimmed milk.

TABLE 6.—*Composition of Self-Rising Flours and Mixes (Submitted by Manufacturers)*

Product	Moisture, %	Total Solids, %	Ash, %	Fat,* %	Protein,† %	Crude Fiber, %	Carbo-hydrates,‡ %	Calories Per Gm.	Calories Per Oz.
Biscuit mixes	8.5-10.7	89.3-91.5	2.8-6.7	9.1-15.0	7.5-11.0	0.1-0.5	58 S-65 6	3.93-4.13	110-117
Biscuit mixes with 50% whole wheat flour	9.5-10.0	90.0-90.5	7.0-7.3	13.0-13.7	9.4-11.0	1.4-1.3	56 6-59.8	3.94	112
Gingerbread mix	4.5	95.5	2.5	27.4	5.0	0.2	60.4	5.08	144
Pancake flours	8.8-12.9	87.1-91.2	4.1 6.4	1.0-2.7	8.6-12.3	1.3-0 3	66.4-74.7	3 35-3.49	95-99
Self-rising flour	11.0-14.5	85.5-89.0	3.6-5.7	0.S-1.6	S.2-12.0	0 5-0.2	67.8-78 0	3 27-3 57	93-101

* Ether extract.
† N × 6.25.
‡ Other than crude fiber (by difference).

The Blair Milling Company, Atchison, Kan.

BLAIR'S BRAND SELF RISING FLOUR, containing patent flour milled from red winter wheat (bleached), sodium chloride, calcium phosphate ($CaH_4[PO_4]_2 \cdot H_2O$) and sodium bicarbonate.

BLAIR'S WHITE FOX BRAND SELF RISING FLOUR, containing standard patent flour milled from hard winter wheat (bleached), sodium chloride, calcium phosphate ($CaH_4[PO_4]_2 \cdot H_2O$) and sodium bicarbonate

Bob White Flour Mills, Kingfisher, Okla.

BOB WHITE BRAND SELF RISING FLOUR, containing patent flour milled from hard wheat (bleached), sodium chloride, calcium phosphate ($CaH_4[PO_4]_2 \cdot H_2O$) and sodium bicarbonate

F. B. Chamberlain Company, St. Louis.

READY FOR USE BRAND BISCUIT MIX, containing patent wheat flour (bleached), hydrogenated cottonseed oil, dried skimmed milk, sucrose, sodium pyrophosphate ($Na_4P_2O_7 \cdot 10H_2O$), sodium chloride, sodium bicarbonate and calcium phosphate ($CaH_4[PO_4]_2 \cdot H_2O$)

Collin County Mill & Elevator Co., Incorporated, McKinney, Texas.

MARECHAL NEIL BRAND SELF RISING FLOUR, containing patent wheat flour (bleached) milled from hard and soft wheats, sodium chloride, calcium phosphate ($CaH_4[PO_4]_2 \cdot H_2O$) and sodium bicarbonate

SWEET PEA BRAND SELF RISING FLOUR, containing stuffed straight wheat flour milled from blended hard and soft wheats (bleached), calcium phosphate ($CaH_4[PO_4]_2 \cdot H_2O$), sodium chloride and sodium bicarbonate.

The Chicago Dietetic Supply House, Inc., Chicago.

CELLU ONE-THREE-THREE BRAND SELF RISING FLOUR, *See* section IX, "Foods for Special Dietetic Purposes," page 313

Commander-Larabee Milling Company, Minneapolis, product distributed by Commander-Larabee Cereal Company, Minneapolis.

AIRY FAIRY KWIK-BIS-KIT BRAND BISCUIT MIX, containing patent flour milled from soft wheat, vegetable fat, calcium phosphate ($CaH_4[PO_4]_2 \cdot H_2O$), sucrose, sodium bicarbonate, dried skimmed milk and sodium chloride.

The Concordia Milling Company, Concordia, Kan.

SUNRISE BRAND PANCAKE FLOUR, containing patent flour milled from bleached hard wheat, sodium bicarbonate, calcium phosphate ($CaH_4[PO_4]_2 \cdot H_2O$), dextrose, sodium chloride and dried skimmed milk.

SUNRISE BRAND PANCAKE FLOUR WITH WHOLE WHEAT, containing patent flour milled from hard wheat (bleached), whole wheat flour, dextrose, calcium phosphate ($CaH_4[PO_4]_2 \cdot H_2O$), sodium bicarbonate and sodium chloride.

Fant Milling Company, Sherman, Texas.

FANTS' BIRTHDAY BRAND SELF RISING FLOUR, containing short patent flour milled from hard and soft wheat (bleached), sodium chloride, calcium phosphate ($CaH_4[PO_4]_2 \cdot H_2O$) and sodium bicarbonate.

READY TO BAKE BRAND SELF RISING FLOUR, same as Fants' Birthday Brand Self Rising Flour.

HAPPY JACK BRAND SELF RISING FLOUR, containing long patent flours milled from soft and hard wheats (bleached), sodium chloride, calcium phosphate ($CaH_4[PO_4]_2 \cdot H_2O$) and sodium bicarbonate.

X-CELLENCE BRAND SELF RISING FLOUR, same as Happy Jack Brand Self Rising Flour.

Federal Mill, Inc., Lockport, N. Y.

QUIX-A-WINK BRAND SELF RISING FLOUR, containing short patent flour milled from soft winter wheat (bleached), sodium pyrophosphate ($Na_4P_2O_7.10H_2O$), sodium chloride and sodium bicarbonate.

Fisher Flouring Mills Co., Incorporated, Seattle.

FISHER'S BRAND BISCUIT MIX, containing short patent flour, hydrogenated vegetable fat, sodium chloride, dried skimmed milk, sodium bicarbonate, sucrose, dextrose, calcium phosphate ($CaH_4[PO_4]_2.H_2O$), calcium lactate and sodium pyrophosphate ($Na_4P_2O_7.10H_2O$).

FISHER'S BRAND PANCAKE FLOUR, containing wheat flour, corn meal, rice flour, dried skimmed milk, dextrose, sodium chloride, sodium bicarbonate, calcium phosphate ($CaH_4[PO_4]_2.H_2O$) and sodium aluminum sulfate ($Na Al[SO_4]_2$).

General Mills Inc., Minneapolis.

GOLD MEDAL "KITCHEN TESTED" BRAND SELF RISING FLOUR, containing patent flour, calcium phosphate ($CaH_4[PO_4]_2.H_2O$) and sodium bicarbonate.

BISQUICK BRAND BISCUIT MIX, containing patent flour milled from hard wheat (bleached), vegetable fat, calcium phosphate ($CaH_4[PO_4]_2.H_2O$), sucrose, dried skimmed milk, sodium chloride and sodium bicarbonate.

BISQUICK WITH WHOLE WHEAT BRAND BISCUIT MIX, containing patent flour milled from hard wheat, whole wheat flour, vegetable fat, calcium phosphate ($CaH_4[PO_4]_2.H_2O$), sucrose, dried skimmed milk, sodium chloride and sodium bicarbonate.

Gilster Milling Company, Chester, Ill.

GILSTER'S BRAND SELF RISING FLOUR, containing short patent flour milled from soft winter wheat (bleached), calcium phosphate ($CaH_4[PO_4]_2.H_2O$), sodium chloride and sodium bicarbonate.

GILSTER'S FEATHERLITE BRAND SELF RISING FLOUR, containing standard patent flour milled from soft winter wheat, calcium phosphate ($CaH_4[PO_4]_2.H_2O$), sodium chloride and sodium bicarbonate.

GILSTER'S MOTHER'S JOY BRAND SELF RISING FLOUR, same as Gilster's Featherlite Brand Self Rising Flour.

Hecker-H-O Company, Inc., Buffalo.

HECKER'S CREAM BUCKWHEAT AND WHEAT FLOUR BRAND PANCAKE FLOUR, containing buckwheat flour and clear patent flour milled from winter wheat, calcium phosphate ($CaH_4[PO_4]_2.H_2O$), sodium chloride and sodium bicarbonate.

HECKER'S GRANDMA'S BRAND PANCAKE FLOUR, containing clear patent flour milled from winter wheat, corn flour, rice flour, dextrose, sodium chloride, calcium phosphate ($CaH_4[PO_4]_2.H_2O$) and sodium carbonate.

HECKER'S OLD HOMESTEAD BRAND PANCAKE FLOUR, same as Hecker's Grandma's Brand Pancake Flour.

PRESTO BRAND SELF RISING CAKE FLOUR, containing patent flour milled from soft wheat, sodium bicarbonate, calcium phosphate ($CaH_4[PO_4]_2.H_2O$) and potassium tartrate ($K_2C_4H_4O_6.\frac{1}{2}H_2O$).

The Hills Brothers Company, New York.

DROMEDARY BRAND GINGERBREAD MIX, containing flour, sucrose, hydrogenated vegetable fat, dried molasses, dried eggs, spices, baking powder, calcium phosphate ($CaH_4[PO_4]_2.H_2O$), sodium pyrophosphate ($Na_4P_2O_7.10H_2O$); sodium bicarbonate, and corn starch, dried skimmed milk and sodium chloride.

Kremex Cereal Division, Greenville, Ohio. *See* Allied Mills, Inc., Chicago.

Lexington Roller Mills Co., Incorporated, Lexington, Ky.

CREAM BRAND SELF RISING FLOUR, containing standard short patent flour milled from soft red winter wheat (bleached), calcium phosphate ($CaH_4[PO_4]_2 .H_2O$), sodium bicarbonate and sodium chloride.

The Light Grain & Milling Co., Liberal, Kan.

FAIRY QUEEN BRAND SELF RISING FLOUR, containing standard patent flour milled from hard winter wheat (bleached), calcium phosphate ($CaH_4[PO_4]2 .H_2O$), sodium chloride and sodium bicarbonate.

GRIDDLE KING BRAND PANCAKE FLOUR, containing short patent flour milled from winter wheat, rye flour, corn flour, dextrose, calcium phosphate ($CaH_4[PO_4]_2 .H_2O$), sodium bicarbonate, sodium chloride and dried skimmed milk.

LIGHT'S OVEN-PERFECT BRAND SELF RISING FLOUR, same as Fairy Queen Brand Self Rising Flour.

LIGHT'S OVEN-PERFECT BRAND BISCUIT MIX, containing short patent flour milled from hard winter wheat (bleached), hydrogenated vegetable fat, dried skimmed milk, sodium chloride, sodium bicarbonate, sodium pyrophosphate ($Na_4P_2O_7$ $10H_2O$) and calcium phosphate ($CaH_4[PO_4]_2$ $.H_2O$).

Maney Milling Company, Omaha.

GOLDEN DAWN BRAND PANCAKE FLOUR, containing first clear patent flour milled from hard wheat (bleached), corn flour, rye flour, rice flour, dried skimmed milk, dextrose, calcium phosphate ($CaH_4[PO_4]_2 .H_2O$), sodium chloride and sodium bicarbonate.

Noblesville Milling Co., Noblesville, Ind.

KISMET BRAND BISCUIT MIX, containing patent flour milled from soft wheat (bleached), edible fat, dried skimmed milk, dextrose, sodium pyrophosphate ($Na_4P_2O_7 .10H_2O$), sodium chloride and sodium bicarbonate

The Quaker Oats Company, Chicago.

AUNT JEMIMA BRAND BUCKWHEAT, CORN AND WHEAT PANCAKE FLOUR containing buckwheat flour, corn flour, wheat flour, dried skimmed milk, dextrose, rice flour, sodium bicarbonate, calcium phosphate ($CaH_4[PO_4]_2$ $.H_2O$) and sodium chloride.

AUNT JEMIMA BRAND PANCAKE FLOUR, containing wheat flour, corn flour, rice flour, rye flour, dried skimmed milk, corn sugar, sodium bicarbonate, calcium phosphate ($CaH_4[PO_4]_2 .H_2O$) and sodium chloride.

The Robinson Milling Company, Salina, Kan.

BETTY JANE BRAND SELF RISING FLOUR, containing standard patent flour milled from hard wheat (bleached), calcium phosphate ($CaH_4[PO_4]_2$ $.H_2O$), sodium chloride and sodium bicarbonate.

MARY LOU BRAND SELF RISING FLOUR, containing straight flour milled from hard winter wheat (bleached), calcium phosphate ($CaH_4[PO_4]_2$ $.H_2O$), sodium chloride and sodium bicarbonate.

ROBIN'S BRAND SELF RISING FLOUR, same as Betty Jane Brand Self Rising Flour.

Saxony Mills, St. Louis.

ARBITRATOR BRAND SELF RISING FLOUR, containing patent flour milled from soft winter wheat (bleached), calcium phosphate ($CaH_4[PO_4]_2 .H_2O$), sodium bicarbonate and sodium chloride.

CHARMER BRAND SELF RISING FLOUR, containing patent flour milled from soft winter wheat (bleached), calcium phosphate ($CaH_4[PO_4]_2 .H_2O$), sodium bicarbonate and sodium chloride.

JUST RIGHT BRAND SELF RISING FLOUR, same as Charmer Brand Self Rising Flour.

SAXONY BRAND SELF RISING FLOUR, same as Charmer Brand Self Rising Flour.

Wilkins-Rogers Milling Company, Incorporated, Washington, D. C.

WASHINGTON BRAND SELF-RISING FLOUR, containing flour milled from soft wheat, calcium phosphate ($CaH_4[PO_4]_2 \cdot H_2O$), sodium bicarbonate and sodium chloride.

The Zanol Products Co., Cincinnati. *See* The American Products Co., Cincinnati.

The following firm distributes under its own labels products purchased from manufacturers of accepted products now privileged to use the Seal of Acceptance. The labels and advertising conform to the Rules and Decisions of the Council.

Nash Finch Company, Minneapolis.

OUR FAMILY BRAND BUCKWHEAT PANCAKE FLOUR, containing buck wheat flour, first clear patent wheat flour, white corn flour, calcium phosphate ($CaH_4[PO_4]_2 \cdot H_2O$), sodium bicarbonate, sodium chloride, dextrose and dried skimmed milk.

OUR FAMILY BRAND PANCAKE FLOUR, containing first clear patent wheat flour, white corn flour, rye flour, calcium phosphate ($CaH_4[PO_4]_2 \cdot H_2O$), sodium chloride, sodium bicarbonate, dextrose and dried skimmed milk.

Wheat Breakfast Cereals, Including Farinas and Bran

Wheat is prepared for human consumption in a wide variety of cooked and uncooked forms, in addition to the milling products and flour preparations already described. The whole kernel may be simply cracked and sold as a brand of breakfast cereal; the whole kernel or parts of the grain may be cooked, inflated, flavored and toasted, or the grain may appear cooked and shredded and otherwise rendered attractive.

Many of the breakfast cereal products are fabricated from one of the three main structures of the wheat kernel. The bran products are obtained from the outer layers of the kernel, the so-called branny layers. These portions of the grain and of course products made from them are characteristically rich in cellulose and low in caloric value; they are usually good sources of vitamin B_1, phosphorus and iron. The vitamin B_1 content is easily lowered by heat treatment, and claims for this factor in a commercial product cannot be recognized unless they are supported by satisfactory experimental evidence.

The endosperm, which constitutes the greater portion of the grain, is the source of the farinas and semolinas. Federal standards[35] define farina as the purified middlings of hard wheat other than durum and semolina as the purified middlings of durum wheat. Purified middlings are the granular products obtained in the commercial process of milling wheat. Middlings consist of the portion of the endosperm retained on 10XX silk bolting cloth. The product contains no more flour than is consistent with good commercial practice and not more than 15 per cent moisture. The composition of accepted farinas and semolinas is given in table 7.

35. Service and Regulatory Announcements, Food and Drug No. 2, fifth revision, United States Department of Agriculture, Food and Drug Administration, November 1936.

TABLE 7.—*Composition of Wheat Products (Submitted by Manufacturers)*

Product	Moisture, %	Total Solids, %	Ash, %	Fat,* %	Protein,† %	Crude Fiber, %	Carbo-hydrates,‡ %	Calories	
								Per Gm.	Per Oz.
Bran									
40 per cent, flaked	4.6	95.4	4.1	1.6	11.5§	3.9	74.3	3.58	102
Shredded, flavored	1.1-2.7	97.3-98.9	6.4-7.2	2.1-3.0	12.0-13.9¶	8.3-8.8	66.5-69.2	3.39-3.49	97-99
Farina									
Plain	8.7-12.6	91.3-87.4	0.4	0.4-1.2	9.8-12.5¶	0.2-0.4	73.8-79.2	3.66-3.52	100-104
With bran	14.0	86.0	0.7	1.3	11.6§	0.7	71.7	3.45	98
With wheat germ	9.0	91.0	0.5	1.3	8.2§	0.4	80.6	3.67	104
With wheat germ and bran	10.1-13.5	86.5-89.9	1.2-1.4	1.4-2.8	9.9-14.6§	1.0-1.5	69.7-75.0	3.44-3.59	98-102
With malted barley	11.5	88.5	0.5	1.2	11.9#	0.9	74.0	3.54	101
Mixed cereals									
Whole wheat with malted barley	2.5	97.5	2.7	0.9	11.6#	2.2	80.1	3.75	107
Whole wheat with rye	8.8	91.2	1.8	1.8	12.7#	1.7	73.4	3.60	102
Semolina									
Plain	13.0-14.5	85.5-87.0	0.6	0.8-1.5	12.7-13.5¶	0.2-0.4	69.5-72.7	3.36-3.58	95-102
With cornmeal	8.1	91.9	0.9	1.7	12.7#	0.8	75.8	3.69	105
With rice cellulose	7.1	92.9	2.0	0.6	13.0#	5.6	71.7	3.44	98
With toasted barley malt	11.7	88.3	1.2	2.5	17.1#	1.6	65.9	3.6	102

Wheat products									
Biscuits........................	4.0	96.0	1.8	9.4	8.6#	0.2	76.0	4.23	119
Bread, dried, toasted......	5.5	94.5	0.7	8.7	12.3#	0.2	72.6	4.18	119
Bread, whole wheat, dried, toasted..............	8.6	91.4	1.8	8.9	13.6#	1.9	15.2	3.95	112
Cracked wheat**..	9.4-10.0	90.6-90.0	1.6-2.0	1.6-1.8	12.2-12.6§	2.5-2.9	72.7-70.5	3.54-3.49	101-99
Expanded wheat....	7.4- 2.0	92.6-98.0	1.7-1.4	1.3-1.5	15 7-15.2§	0.8-2.0	73.1-77.9	3.67 3.86	104-110
Flaked wheat, plain..	10.1	89.9	1.7	2.2	11.1§	1.2	73.7	3.59	102
Flaked wheat, flavored.. . .	3.6	96.4	3.2	1.1	11.7§	1.2	79.2	3.74	106
Flaked whole wheat, plain..	11.9	88 1	1.6	2.1	12.1§	2.2	68.9	3 43	97
Flaked whole wheat, flavored...	1.5	98.5	4.5	1.2	12.8§	1.8	78.2	3.75	107
Toasted wheat with malted wheat flour....... .. .	4.7	95 3	1.8	1.7	14.0§	1.8	76.0	3.75	107

* Ether extract.

† Factors for converting percentages of nitrogen into percentages of protein are those specified by D. B. Jones (Factors for Converting Percentages of Nitrogen in Foods and Feeds into Percentage of Protein, Circular 183. United States Department of Agriculture, August 1931).

‡ Others than crude fiber (by difference).

§ N × 5.83.

‖ N × 6.31.

¶ N × 5.7.

\# N × 6.25.

** Minus some endosperm and bran.

Under the federal Food, Drug and Cosmetic Act, fanciful trade names for a farina or semolina are not permitted unless followed conspicuously by the words "a farina product" or "a semolina product."

In recent years there has been a decided trend to improve the nutritional value of farinas and semolinas by the addition of wheat germ, certain minerals such as calcium and iron and vitamin B_1. If such ingredients are added to farina or semolina, it then becomes necessary under the law to declare prominently the presence of those ingredients by their common name. Such fortified cereals are discussed and listed in section VI, entitled "Preparations Used in the Feeding of Infants."

Products that are fabricated from the wheat germ, or embryo, are discussed and listed in section IX, entitled "Foods for Special Dietetic Purposes."

The composition of the various wheat products that stand accepted by the Council on Foods is given in table 7. Data concerning vitamin and mineral content are included in the description of the individual product when such information is known to the Council.

Bran

Composition.—Wheat bran consists of the outer coats of the wheat grain which can be separated from the germ and from various grades of flour during the milling process. The commercial product usually contains some of the wheat embryo and a small amount of endosperm because of the difficulty of making a sharp separation. The bran amounts to approximately 12 to 15 per cent of the grain. There are two principal varieties of bran used for human consumption on the market. Untreated bran is the mill product widely used for feeding animals and also, after cleaning, to some extent for incorporation into dough mixtures for making certain bakery products such as bran muffins. The prepared type of bran has been subjected to processes designed to improve its palatability, and it is distributed primarily as a breakfast cereal food. The processing may vary somewhat. The general procedure consists of washing the crude bran (sometimes with dilute acid, then with water) and mixing with malt syrup, sugar, salt and water. The mixture is cooked and finally dried and packaged. Frequently it is shredded or toasted before being packed in cartons.

The two varieties, crude and prepared bran, differ in their composition because certain soluble substances are lost during the washing of bran and other substances are added. A number of years ago Osborne and Mendel [36] reported an analysis of a crude bran product. Their figures (table 8) are reported on the water-free basis. For comparison, published figures

36. Osborne, T. B., and Mendel, L. B.: The Nutritive Value of the Wheat Kernel and its Milling Products, J. Biol. Chem. **37**: 557 (April) 1919.

for a prepared bran product are also shown. They bring out a number of essential differences between the so-called breakfast food type of bran and the ordinary milled product It may be noted that the amount of fiber which is present in the two products is somewhat less in the prepared bran than in the original material. Another difference, not shown in the table, between the commercial bran and the mill product is in the amount of phytin that is present. The washing process, especially if done with dilute acid, may remove considerable phytin from the original material. Phytin exists in bran as the potassium, calcium and magnesium salts of the hexaphosphoric acid ester of inositol. Cowgill and Anderson [37] concluded from their work with human beings that the loss of phytin is of no significance as far as the laxative properties of bran are concerned.

TABLE 8.—*Comparative Composition of a Crude and a Prepared Bran*

	Moisture-Free Basis	
Component	Crude Bran.* Percentage	A Prepared Bran,† Percentage
Ash	7.2	8.4
NaCl	...	3.2
Fat (ether extract)	7.1	3.3
Protein (N × 6.25)	17.0	14.3
Sucrose	1.6	9.2
Crude fiber	9.4	7.9
Carbohydrates other than crude fiber (by difference)†	59.8‡	66.1

* Data based on report by Osborne and Mendel [36]

† Data based on report published in The Journal of the American Medical Association (**104**: 474 [Feb. 9] 1935).

‡Osborne and Mendel found 27.6 per cent pentosans, 13.4 per cent starch and 4.2 per cent dextrin in crude bran, moisture free.

Other differences between crude and prepared bran to which attention should be directed are the concentrations of sodium chloride and of iron. Salt is usually added in the preparation of the breakfast foods, and this accounts for the presence of about 2 to 3 per cent sodium chloride. The amount of iron in the prepared bran products is stated to be from about 17 to 25 mg. per hundred grams.[38] Crude bran ranks as a food rich in iron; it contains about 8 to 10 mg. of iron per hundred grams of dried bran.[39] Analyses performed in a university laboratory for the Council on Foods are reported in

37. Cowgill, G. R., and Anderson, W. E.: Laxative Effects of Wheat Bran and "Washed Bran" in Healthy Men, J. A. M. A. **98**: 1866 (May 28) 1932.
38. Whole Bran, report of the Council on Pharmacy and Chemistry, J. A. M. A. **100**: 1238 (April 22) 1933. Kellogg's All-Bran, report of the Committee on Foods, ibid. **104**: 474 (Feb. 9) 1935.
39. Peterson, W. H., and Elvehjem, C. A.: The Iron Content of Plant and Animal Food, J. Biol. Chem. **78**: 215 (June) 1928.

table 9. These figures show that the iron content of certain bran products as purchased on the open market is considerably higher than the amount of iron which is to be found in the mill product. Considering that there are few food products of vegetable origin which even approach in iron content the high values of crude bran, it is difficult to understand how the iron content of prepared bran can be almost double that of the mill product. This raises the question of whether the iron content of wheat bran is exceedingly variable or whether iron is introduced in some manner during the processing treatment.

Nutritive Value of Bran.—Crude bran contains a relatively high percentage of ash. This ash is rich in phosphorus, which is present in the bran as phosphate esters of inositol and also as phospholipids and other compounds. Little significance has been attached to this fact, however, because phosphates can be obtained from many common articles of the human diet, and there appears to be little possibility that a deficiency of this element may occur in the usual American diet. Moreover, washed bran may contain only one-tenth as much phosphorus as crude bran.[40]

TABLE 9.—*The Iron Content of Crude Bran and Prepared Bran*

Product	Moisture, Percentage	Iron, Mg. Per 100 Gm.
Kellogg's "All-Bran"	5.4	15.3
Post's "Whole Bran"	8.8	16.4
Crude bran	9.8	9.5

The presence of approximately 3 per cent of sodium chloride in the prepared bran products has already been mentioned. This fact would have significance in the formulation of diets in which a low salt intake is desired.

From the nutritional standpoint, the most important inorganic constituent of bran is iron. Attention has already been directed to the striking differences in the iron content of prepared bran products as compared with crude bran. Rose, Vahlteich and MacLeod[41] showed that the iron of bran was somewhat more effective in the production of hemoglobin in anemic rats than iron-equivalent quantities of egg yolk and of liver. Good results were also obtained when anemic rats were fed whole wheat as compared with the results observed when a solution of the ash of the same amount of wheat was fed.

40. Falcon-Lesses, M.: Cause of the Laxative Action of Bran, J. Nutrition 2: 295 (Jan.) 1930.

41. Rose, M. S.; Vahlteich, E. M., and MacLeod, G.: Factors in Food Influencing Hemoglobin Regeneration, J. Biol. Chem. 104: 217 (Feb.) 1934.

Subsequent experiments have shown further that the iron of bran is as well utilized as the iron of ferric chloride. In two subjects, both of whom were young women, Vahlteich, Funnell, MacLeod and Rose [42] showed that the iron of bran was as well utilized as the iron of egg yolk. The amounts of egg yolk or of bran consumed by these experimental subjects furnished 3 mg. of iron daily. It required 58 Gm. of egg yolk and 15 Gm. of bran to furnish this amount of iron.

The protein content of bran averages about 17 per cent, which is about 50 per cent higher than the value for whole wheat. Although the amino acid makeup of these proteins indicates a good nutritional value, Rubner early showed that the proteins of bran are digested with difficulty. Funnell, Vahlteich, MacLeod and Rose [43] calculated from their experiments that about 50 per cent of the protein of bran was utilized by their subjects (young women). It must be concluded that the proteins of bran are poorly utilized. Moreover, in the amounts that might ordinarily be consumed, it is apparent that the proteins of bran can contribute but little to the daily protein requirements of man.

The only vitamin known to occur to an appreciable extent in wheat bran is the vitamin B complex, and in particular vitamin B_1. Wheat bran contains somewhat more vitamin B_1 than whole wheat, but is only about one-eighth as rich as wheat germ.

The most publicized components of bran are the carbohydrates, particularly the indigestible carbohydrates referred to as crude fiber. In the dried commercial product reported on by Osborne and Mendel there were approximately 17 per cent starch and dextrins, 27 per cent pentosans and 9 per cent fiber. As pointed out by Rose and her collaborators,[44] true values for the carbohydrates are probably slightly higher than the figures reported.

About one third of the total carbohydrate, comprising the starch and dextrin, is digestible and therefore serves as a source of energy. The role of pentosans in nutrition has been reviewed by McCance and Lawrence.[45] These carbohydrates, chiefly arabans and xylans, are of negligible food value because no enzymes of the alimentary tract are capable of hydrolyzing them. The same is true of cellulose, which makes up a considerable portion of the material called "crude fiber." However, bacterial action, which may convert considerable of the

42. Vahlteich, E. M.; Funnell, E. H.; MacLeod, G., and Rose, M. S.: Egg Yolk and Bran as Sources of Iron in the Human Dietary, J. Am. Dietet. A. **11**: 331 (Nov.) 1935.

43. Funnell, E. H.; Vahlteich, E. M.; Morris, S. O.; MacLeod, G., and Rose, M. S.: Protein Utilization as Affected by the Presence of Small Amounts of Bran or Fiber, J. Nutrition **11**: 37 (Jan.) 1936.

44. Rose, M. S.; MacLeod, G.; Vahlteich, E. M.; Funnell, E. H., and Newton, C. L.: The Influence of Bran on the Alimentary Tract, J. Am. Dietet. A. **8**: 133 (July) 1932.

45. McCance, R. A., and Lawrence, R. D.: The Carbohydrate Content of Foods, Medical Research Council, London, His Majesty's Stationery Office, 1929.

pentosans into volatile fatty acids, has less effect on cellulose. The latter when fed is recoverable to a large extent in the feces. Bran thus contributes bulk to the diet, and it was early recognized as having a laxative effect because of this fact.

The Laxative Effect of Bran.—It seems reasonable to conclude from the evidence available that the weight of the fecal material and the number of daily bowel movements are dependent largely on the bulk in the diet and that in normal men and women and in some constipated subjects both may be increased by the ingestion of suitable amounts of bran. It also appears to be demonstrated that the fiber of bran is more resistant to decomposition in the alimentary tract than the fiber of many ordinary foods. The number of daily bowel movements that can be considered normal, however, is still open for further investigation. There is evidence also that some foods, such as prunes and fruit juices, may exert an effect which cannot be attributed to fiber or bulk. It may also be pointed out that other components of the usual diet, such as carbohydrates and fats, may exert an effect on what Cowgill and Anderson [37] have called "laxation."

Indigestible carbohydrates in bran must be considered in relation to their effect on the digestibility of food proteins and on the retention of minerals. Mendel and Fine, for example, showed with dogs that the addition to the diet of indigestible material such as agar or bone ash resulted in an increase in the fecal nitrogen. This effect has been shown by others to occur in persons also. In explanation it has been suggested that the presence of bulk may retard proteolytic digestion; a greater amount of metabolic nitrogen from digestive juices, and so on, which escape reabsorption, is produced; the intestinal contents are propelled more rapidly and hence not as completely absorbed. Whatever the reason, it appears that the effect produced by moderate amounts of fiber on protein digestion, while definite, is slight.[46] With abnormally high amounts of roughage, such as might be found in certain Chinese diets, Adolph and Wu [47] observed a definite lowering of protein digestibility.

Whitacre, Willard and Blunt [48] found that the addition of fiber in the form of vegetables had no effect on the utilization of dietary fat. Morgan [49] studied the effect of the ingestion of moderate amounts of a cellulose preparation on young women. She found a slightly increased excretion of fecal nitrogen and a definite increase in the excretion of phosphorus, calcium and

---

46. Cowgill, G. R., and Sullivan, A. J.: Further Studies on the Use of Wheat Bran as a Laxative, J. A. M. A. **100**: 795 (March 18) 1933.

47. Adolph, W. H., and Wu, M. Y.: The Influence of Roughage on Protein Digestibility, J. Nutrition **7**: 381 (April) 1934.

48. Whitacre, J.; Willard, A., and Blunt, K.: Influence of Fiber on Nitrogen Balances and on Fat in the Feces of Human Subjects, J. Nutrition **2**: 187 (Nov.) 1929.

49. Morgan, H.: The Laxative Effect of a Regenerated Cellulose in the Diet: Its Influence on Mineral Retention, J. A. M. A. **102**: 995 (March 31) 1934.

fecal ash. She questioned the wisdom of giving a high roughage diet to children or to older persons under conditions of a marginal intake of calcium.

Disadvantages of the Use of Bran.—In addition to the effect of bran on calcium excretion, there are other possible disadvantages of its use which demand thoughtful consideration. To many persons bran is irritating to the mucous lining of the intestinal tract. It is self evident that bran or other rough foods may do serious injury if included in the diet of a patient who has recently undergone operation of the stomach or intestine or who suffers with ulcer, carcinoma or some other organic disorders of the gastrointestinal tract. Patients with such conditions occasionally have constipation, as do at times patients with ulcerative colitis of amebic or bacterial origin. If under any of these circumstances bran is resorted to as a means of relieving the constipation, the previously diseased tissue will be irritated, with results that may be disastrous.

It generally is less well appreciated that the constipation of many otherwise healthy persons results from spasticity of the colon and that under these circumstances bland diets are more effective in controlling the constipation than is any rough, mechanically irritating food like bran. In such cases bran may so intensify the spasticity that obstruction necessitating mechanical or even surgical removal may result from its use.[50]

It is the experience of many physicians that in otherwise normal persons who suffer from constipation due solely to inadequate bulkiness of their diets the colons will become irritable if bran is taken in excessive doses for a short time or in ordinary doses continuously for longer times.[51] Vague abdominal pains occur, associated with bloating, belching and excessive flatus; these symptoms promptly disappear when the ingestion of bran is discontinued.

Danger from the use of bran is greatest when constipated persons eat bran and, not obtaining relief with small portions, take larger quantities. The indiscriminate use of bran without the supervision of physicians therefore is undesirable. While many constipated persons without any digestive disorders may be benefitted by the addition to their diets of bran in doses that are not excessive, to alternate the use of bran with agar and other allied products or to provide diets containing an adequate amount of residue less coarse than bran is considered to be a more desirable therapeutic procedure.

Constipation may be due to causes other than those of dietary or roughage origin. Advertising to the laity should refer to constipation due to insufficient roughage or food essentials only. This is considered an important requirement in the interest of the health of the people. In cases of constipation not yielding

50. Davis, M. B.: Intestinal Obstruction from Eating Bran, J. A. M. A. 97:24 (July 4) 1931.

51. Alvarez, W. C.: Opinion of Four Hundred Seventy Physicians in Regard to the Advantages and Disadvantages of Using Bran and Roughage, Minnesota Med. 14:296 (April) 1931.

to the regular ingestion of foods providing considerable roughage the persons should be under the care of a competent physician A permissible claim for a roughage food follows

> Constipation due to insufficient roughage in the diet should yield to . eaten regularly. A competent physician should be consulted for constipation not corrected in this simple manner

Conclusion.—Wheat bran has laxative value due predominantly to the fiber content and not to phytin or other constituents. Whole grain cereals and vegetables and fruits in general are excellent sources of roughage. Bran itself may be irritating to sensitive bowels; the indigestible cellulose of vegetables and fruits is much less irritating.

Prepared bran also is recognized as a rich dietary source of phosphorus, iron and vitamin B_1 and as a significant source of calcium. One ounce (28 Gm.; approximately 4 heaping table spoonfuls) of bran contains 4 54 Gm of protein, 17.04 Gm of carbohydrates, 1.73 Gm. of fat, 53 calories, 0 034 Gm. of calcium, 0.345 Gm. of phosphorus, 2.41 mg. of iron, and 28.4 international units of vitamin B_1.

According to the Council on Foods' method [52] of rating food, prepared bran is recognized as a rich source of phosphorus, iron and vitamin B_1, and as a significant source of calcium. One ounce of bran provides these substances in approximately the following amounts

Substance	Fraction of Daily Requirement
Calcium..	1/21
Phosphorus	1/4
Iron.	1/6
Vitamin B_1	1/14

The listed products of the following firms stand accepted:

Albers Bros. Milling Co., Seattle, Wash. *See* Carnation Company, Oconomowoc, Wis.

Big Diamond Mills Company, Minneapolis. *See* Commander-Larabee Milling Company, Minneapolis.

Campbell Cereal Company, Minneapolis.

MALT-O-MEAL, a mixture of farina and toasted malted barley

Carnation Company, Oconomowoc, Wis., products distributed by Albers Bros. Milling Co., Seattle.

ALBERS BRAND FARINA, wheat middlings from hard wheat.

Analysis (submitted by manufacturer).—Moisture 10 5%, total solids 89.5%, ash 0.4%, fat 0.8%, protein (N × 5 7) 10.5%, crude fiber 0.4%, carbohydrates other than crude fiber (by difference) 77.4%, reducing sugars 0.0%, sucrose 2.2%.

Calories.—3.19 per gram; 91 per ounce.

ALBERS BRAND PEARLS OF WHEAT, wheat middlings from hard wheat, same as Albers Brand Farina.

---

52. The "Normal" Diet, report of the Council on Foods, American Medical Association, 1938.

CARNATION BRAND FLAKED WHEAT, a flaked cooked white wheat with the coarser bran portion removed.

Analysis (submitted by manufacturer).—Moisture 10.1%, total solids 89.9%, ash 1.7%, protein (N × 5.83) 11.1%, fat (ether extract) 2.2%, crude fiber 1.2%, reducing sugars as invert sugar 0.1%, sucrose 2.7%, carbohydrates other than crude fiber (by difference) 73.7%, phosphorus (P) 0.31%, iron (Fe) 5 mg. per hundred grams, calcium (Ca) 37 mg per hundred grams.

Calories.—3.59 per gram; 102 per ounce.

Commander Milling Company, Minneapolis. *See* Commander Larabee Milling Company, Minneapolis.

Commander-Larabee Milling Company, Minneapolis, product distributed by Minneapolis Milling Company, Minneapolis.

TWO STAR BRAND DURUM SEMOLINA, wheat middlings or endosperm from durum wheat.

Product distributed by Commander Milling Company, Minneapolis.

SUPERIOR BRAND NO. 1 DURUM SEMOLINA, same as Two Star Brand Durum Semolina.

Product distributed by Big Diamond Mills Company, Minneapolis.

BIG DIAMOND NO. 1 SEMOLINA, same as Two Star Durum Semolina

Product distributed by Empire Milling Company, Minneapolis.

FANCY BRAND NO 1 SEMOLINA, same as Two Star Brand Durum Semolina.

Product distributed by the Northland Milling Company, Minneapolis.

FANCY BRAND NO. 1 SEMOLINA, same as Two Star Brand Semolina.

Cream of Wheat Corporation, Minneapolis.

CREAM OF WHEAT BRAND CEREAL, wheat middlings milled from hard wheat.

Dutch Tea Rusk Company, Holland, Mich.

HEKMAN'S BRAND 100 PERCENT WHOLE WHEAT RUSK, round slices of toast prepared from whole wheat flour, whole milk, unrefined sugar, eggs, hydrogenated vegetable fat, yeast, malt extract, sodium chloride and soda.

Analysis (submitted by manufacturer).—Moisture 8.6%, total solids 91.4%, ash 1.8%, fat (ether extract) 8.9%, protein (N × 6.25) 13.6%, crude fiber 1.9%, carbohydrates other than crude fiber (by difference) 65.2%, iron (Fe) 5.7 mg. per hundred grams.

Calories.—3.95 per gram; 112 per ounce.

HEKMAN'S DUTCH TEA BRAND RUSK, round slices of toast prepared from wheat flour, water, sucrose, fat, malt extract, milk, eggs, yeast sodium chloride, lactose, baking soda and lecithin.

Analysis (submitted by manufacturer).—Moisture 5.5%, ash 0.7%, fat (method I for bread) 8.7%, protein (N × 6.25) 12.3%, crude fiber 0.2%, carbohydrates other than crude fiber (by difference) 72.6%.

Calories.—4.2 per gram; 119 per ounce.

HEKMAN'S TULIP BRAND RUSK, same as Hekman's Dutch Tea Brand Rusk.

Empire Milling Company, Minneapolis. *See* Commander-Larabee Milling Company, Minneapolis.

Federal Mill, Inc., Lockport, N. Y.

LUCKY BRAND WHEAT BREAKFAST FOOD, wheat middlings from spring wheat containing some wheat bran.

Analysis (submitted by manufacturer).—Moisture 14.0%, ash 0.71%, fat (ether extract) 1.3%, protein (N × 5.7) 11.6%, crude fiber 0.7%, carbohydrates other than crude fiber (by difference) 71.7%.

Calories.—3.5 per gram; 98 per ounce.

The Fisher Flouring Mills Co., Incorporated, Seattle.

FISHER'S BRAND FARINA, wheat middlings from hard red wheat.

FISHER'S BRAND CRACKED WHEAT, coarsely ground wheat from which a portion of the endosperm and bran have been removed.

General Foods Corporation, New York, product distributed by Postum Company, Inc., Battle Creek, Mich.

POST GRAPE-NUTS BREAKFAST CEREAL, a mixture of whole wheat, malted barley, yeast and sodium chloride.

Analysis (submitted by manufacturer).—Moisture 2.5%, total solids 97.5%, ash 2.7%, fat (ether extract) 0.9%, protein (N × 6.25) 11.6%, crude fiber 2.2%, carbohydrates other than crude fiber (by difference) 80.1%, calcium (Ca) 40 mg. per hundred grams, magnesium (Mg) 0.10, potassium (K) 0.38%, sodium (Na) 0.51%, phosphorus (P) 0.30%, chlorine (Cl) 0.78%, sulfur (S) 0.14%, iron (Fe) 5 mg. per hundred grams.

Calories.—3.75 per gram; 107 per ounce.

POST'S 40 PER CENT BRAN FLAKES WITH OTHER PARTS OF WHEAT, toasted flaked cooked mixture of wheat bran (40 per cent) with adhering endosperm, malt syrup, sugar and sodium chloride.

Analysis (submitted by manufacturer).—Moisture 4.6%, total solids 95.4%, ash 4.1%, sodium chloride (NaCl) 2.3%, fat (ether extract) 1.6%, protein (N × 5.83) 11.5%, reducing sugar as maltose 8.5%, sucrose 4.3%, crude fiber 3.9%, carbohydrates other than crude fiber (by difference) 74.3%, iron (Fe) 8.8 mg. per hundred grams, calcium (Ca) 73 mg. per hundred grams, phosphorus (P) 0.68%.

Calories.—3.58 per gram; 102 per ounce.

POST'S WHOLE BRAN SHREDS, toasted cut shredded cooked wheat bran flavored with malt, syrup, sugar and sodium chloride.

Analysis (submitted by manufacturer).—Moisture 1.1%, total solids 98.9%, ash 7.2%, sodium chloride (NaCl) 2.2%, fat (ether extract) 3.0%, protein (N × 6.31) 13.9%, reducing sugars as maltose 9.0%, sucrose 6.7%, crude fiber 8.3%, carbohydrates other than crude fiber (by difference) 66.5%, calcium (Ca) 0.11%, phosphorus (P) 1.16%, iron (Fe) 12.6 mg. per hundred grams.

Calories.—3.49 per gram; 99 per ounce.

Vitamins.—Biologic assay (1930) showed 1.6 Sherman-Chase (0.8 international) units of vitamin B_1 per gram; 45 per ounce.

General Mills, Inc., Minneapolis, product distributed by Gold Medal Foods, Inc., Minneapolis.

WHEATIES WHOLE WHEAT FLAKES, toasted flaked cooked whole wheat flavored with sucrose, malt syrup and sodium chloride.

Analysis (submitted by manufacturer).—Moisture 1.5%, total solids 98.5%, ash 4.5%, sodium chloride (NaCl) 3.0%, fat (ether extract) 1.2%, protein (N × 5.83) 12.8%, crude fiber 1.8%, carbohydrates other than crude fiber 78.2%.

Calories.—3.75 per gram; 107 per ounce.

Gold Medal Foods, Inc., Minneapolis. *See* General Mills, Inc., Minneapolis.

The Great Atlantic and Pacific Tea Company, New York. *See* The Quaker Maid Company, New York.

Hecker-H-O Company, Inc., Buffalo.

FORCE BRAND TOASTED WHOLE WHEAT FLAKES, toasted flaked cooked whole wheat with only the outer bran layer removed, flavored with sucrose, malt syrup and sodium chloride.

Analysis (submitted by manufacturer).—Moisture 3.6%, fat (ether extract) 1.1%, total solids 96.4%, ash 3.2%, protein (N × 5.83) 11.7%, reducing sugars as invert sugar 1.6%, sucrose 2.1%, crude fiber 1.2%, carbohydrates other than crude fiber (by difference) 79.2%, iron (Fe) 15 mg. per hundred grams.

Calories.—3.74 per gram; 106 per ounce.

HECKERS' BRAND CREAM FARINIA, wheat middlings from hard spring wheat.

H. J. Heinz Company, Pittsburgh.

HEINZ BRAND BREAKFAST WHEAT WITH CEREAL CELLULOSE, toasted flaked cooked ground mixture of durum wheat middlings (semolina), rice hull cellulose, sugar and sodium chloride.

Analysis (submitted by manufacturer).—Moisture 7.1%, total solids 92.9%, ash 2.0%, sodium chloride (NaCl) 0.8%, fat (ether extract) 0.6%, protein (N × 6.25) 13.0%, reducing sugars as dextrose 0.9%, sucrose 1.6%, dextrins (Heinz laboratory method) 5.5%, soluble starch (Heinz laboratory method) 26.8%, crude fiber 5.6%, carbohydrates other than crude fiber (by difference) 71.7%.

Calories.—3.44 per gram; 98 per ounce.

Lifestaff Natural Food Company, St. Louis.

LIFESTAFF BRAND NATURAL GRAIN PORRIDGE, WHEAT AND RYE, a mixture of coarsely ground whole soft wheat and rye.

LIFESTAFF BRAND NATURAL GRAIN MEAL, WHEAT AND RYE, a mixture of finely ground whole soft wheat and rye.

The Light Grain & Milling Company, Liberal, Kan.

VIM BRAND WHEAT BREAKFAST FOOD, cracked wheat from which is removed a portion of the bran and endosperm.

Analysis (submitted by manufacturer).—Moisture 10.0%, total solids 90.0%, ash 2.0%, fat (ether extract), 1.8%, protein (N × 5.83) 12.8%, reducing sugars as invert sugar 0.1%, sucrose 1.5%, crude fiber 2.9%, carbohydrates other than crude fiber (by difference) 70.5%.

Calories.—3.49 per gram; 99 per ounce.

The Maltex Company, Inc., Burlington, Vt.

MALTEX BRAND CEREAL, a mixture of toasted durum wheat (bran and flour removed) and ground baked malted wheat flour.

Analysis (submitted by manufacturer).—Moisture 4.7%, total solids 95.3%, ash 1.8%, sodium chloride (NaCl) 0.2%, fat (ether extract) 1.7%, protein (N × 6.25) 15.3%, crude fiber 1.8%, carbohydrates other than crude fiber (by difference) 74.7%, calcium (Ca) 55 mg. per hundred grams, phosphorus (P) 0.2%, copper (Cu) 0.5 mg. per hundred grams.

Calories.—3.75 per gram; 107 per ounce.

Mellin's Food Company of North America, Boston.

MELLIN'S BRAND FOOD BISCUITS, baked biscuits prepared from wheat flour, Mellin's Food (essentially maltose, dextrins, proteins and minerals), sucrose, oleomargarine and sodium bicarbonate. *See* section VI, entitled "Preparations Used in the Feeding of Infants."

Analysis (submitted by manufacturer).—Moisture 4.0%, total solids 96.0%, ash 1.8%, fat (Roese-Gottlieb method), 9.4%, protein (N × 6.25) 8.6%, reducing sugars as maltose 15.0%, sucrose (diastase method) 13.3%, crude fiber 0.2%, carbohydrates other than crude fiber (by difference) 76.0%.

Calories.—4.2 per gram; 119 per ounce; 17 per biscuit.

Minneapolis Milling Company, Minneapolis. *See* Commander-Larabee Milling Company, Minneapolis.

National Biscuit Company, New York.

N-B-C BRAND BRAN, toasted dried finely milled bran, flavored with sucrose, malt extract, salt and water extract of prunes.

Analysis (submitted by manufacturer).—Moisture 2.7%, total solids 97.3%, ash 6.4%, fat (ether extract) 2.1%, protein (N × 6.31) 12.0%, crude fiber 8.8%, carbohydrates other than crude fiber (by difference) 68.0%, reducing sugars as dextrose 2.0%, sucrose 12.5%, iron (Fe) 18 mg. per hundred grams, phosphorus (P.) 1.36%.

Calories.—3.39 per gram; 96 per ounce.

Vitamins.—Report of biologic assays (1938) showed approximately 1.5 international units of vitamin B_1 per gram; 43 per ouunce.

Northland Milling Company, Minneapolis. *See* Commander-Larabee Milling Company, Minneapolis.

Omaha Flour Mills Co., Omaha.

OMAR BRAND WHEAT CEREAL, a mixture of farina and wheat germ (25 per cent by weight) with a small amount of bran.

Analysis (submitted by manufacturer).—Moisture 11.8%, ash 1.3%, fat (ether extract) 2.8%, crude fiber 1.0%, protein (N × 5.83) 13.4%, carbohydrates other than the crude fiber (by difference) 69.7%.

Calories.—3.57 per gram; 101 per ounce.

Pillsbury Flour Mills Company, Minneapolis.

PILLSBURY BRAND FARINA, granular wheat middlings, or farina (heat treated).

The Purity Products Company, Minneapolis.

SO-DELISHUS BRAND WHEAT WITH CORN, a mixture of durum wheat semolina (two thirds by weight) with white corn meal (heat treated).

The Quaker Maid Company, Inc., New York, product distributed by The Great Atlantic and Pacific Tea Company, New York.

GOLDEN KEY BRAND WHEAT FARINA, wheat middlings from hard wheat.

MELLO-WHEAT BRAND BREAKFAST FOOD, same as Golden Key Brand Wheat Farina.

The Quaker Oats Company, Chicago.

THE NEW PETTIJOHN'S BRAND ROLLED WHEAT WITH ALL THE BRAN, flaked steamed cut whole wheat.

Analysis (submitted by manufacturer).—Moisture 11.9%, ash 1.6%, fat (ether extract) 2.1%, protein (N × 5.83) 12.1%, crude fiber 2.2%, carbohydrates other than crude fiber (by difference) 8.9%.

Calories.—3.5 per gram; 99 per ounce.

QUAKER BRAND PUFFED WHEAT, ready to eat, puffed cooked durum wheat.

The Shellabarger Mill & Elevator Company, Salina, Kan.

1776 GEROLIUM BRAND BREAKFAST CEREAL, wheat middlings containing the wheat germ and considerable bran.

Sims, Division of Siems Bros., Inc., St. Paul.

SIMS MALT-O-WHEAT, semolina flavored with toasted barley malt.

Analysis (submitted by manufacturer).—Moisture 11.7%, total solids 88.3%, ash 1.2%, fat (ether extract) 2.5%, protein (N × 6.25) 17.1%, crude fiber 1.6%, carbohydrates other than crude fiber (by difference) 65.9%.

Calories.—3.6 per gram; 102 per ounce.

Sun Rays Products Co., Grand Rapids, Mich.

SUNRAYS BRAND WHEAT SELEX, heat-treated wheat middlings containing the wheat germ and considerable bran.

The Teichgraeber Milling Co., Gypsum, Kan.

GLORY BRAND WHEAT BREAKFAST CEREAL, heat-treated wheat middlings milled from winter wheat containing wheat germ and considerable bran.

GLORY BRAND WHEAT CREAM FARINA, wheat middlings milled from selected winter wheat free from flour and bran.

GLORY BRAND WHOLE WHEAT, dried cooked whole wheat seasoned with sodium chloride.

The following firms distribute under their own labels the listed wheat products purchased from manufacturers of accepted products now privileged to use the Seal of Acceptance.

Campbell Cereal Company, Minneapolis. *See* Durand-McNeil-Horner Company, Chicago.

Durand-McNeil-Horner Company, Chicago.

NONE-SUCH BRAND WHEAT FOOD, wheat middlings from wheat practically free from bran and flour.

Jobbers Service, Inc., Coldwater, Mich.

DEFIANCE BRAND WHEAT CEREAL, wheat middlings milled from wheat practically free from bran and flour.

Loose-Wiles Biscuit Company, Chicago.

SUNSHINE BRAND DUTCH RUSK, round slices of toast prepared from wheat flour, water, sucrose, fat, malt extract, milk, eggs, yeast, sodium chloride, lactose, baking soda and lecithin

Nation Wide Stores Company, Brockton, Mass.; St. Louis; Toledo, Ohio; Washington, D. C.; Warren, Pa., and Atlanta, Ga.

NATION WIDE BRAND WHEAT FARINA, wheat middlings from wheat practically free from bran and flour.

Oakford & Fahnestock, Peoria, Ill.

BLUE RIBBON BRAND WHEAT CEREAL, wheat middlings from wheat practically free from bran and flour

Twin City Wholesale Grocer Company, St. Paul, Minneapolis and Fargo, N. D.

FAIRWAY BRAND WHEAT CEREAL, granular wheat middlings or farina (heat treated).

Wood County Grocery Co., Wisconsin Rapids, Wis.

FAIRWAY BRAND WHEAT CEREAL, granular wheat middlings or farina (heat treated)

Macaroni, Egg Noodles and Similar Products

The production of macaroni, spaghetti, vermicelli, noodles and their variants is one of the big food industries in the United States. In 1935, over 600,000,000 pounds of such products were fabricated. The volume of production was second only to that of Italy.

For macaroni, noodles, egg noodles and plain noodles the federal standards[35] and definitions have been formulated.

1. MACARONI. The shaped and dried doughs prepared by adding water to one or more of the following: Semolina, farina, wheat flour. It may contain added salt. In the finished product the moisture content does not exceed 13 percent. Various shapes of macaroni are known under distinguishing names, such as spaghetti, vermicelli.

   a. Semolina macaroni is macaroni in the preparation of which semolina is the sole farinaceous ingredient.

   b. Farina macaroni is macaroni in the preparation of which farina is the sole farinaceous ingredient.

2. NOODLES, EGG NOODLES. The shaped and dried doughs prepared from wheat flour and eggs, with or without water and with or without salt. The egg ingredient may be whole egg, egg yolk or both. In the finished product the moisture content does not exceed 13 percent and the egg-solids content upon the moisture-free basis is not less than 5.5 per cent. Noodles are commonly ribbon-shaped.

3. PLAIN NOODLES. The shaped and dried doughs prepared from wheat flour and water, with or without salt. In the finished product the moisture content does not exceed 13 percent. Plain noodles are commonly ribbon-shaped.

Macaroni may also be made with milk as the sole source of liquid. In order to qualify as "milk macaroni" the product should be made with whole milk as the sole liquid ingredient. On the basis of 13 per cent total solids, this would mean about 3 per cent dried whole milk.

The use of color in plain noodles or in macaroni in such a fashion as to suggest egg noodles is considered a violation of the Federal Food and Drug Act, and action has been taken against artificial color in noodles, even when the presence of the color was declared.

In addition to these federal definitions and standards trade practice rules regarding these products have been promulgated by the Federal Trade Commission.[53]

The following rules pertain to composition:

(1) It is unfair in trade practice to sell or offer for sale, advertise, describe, label or otherwise represent directly or indirectly any product as being macaroni, spaghetti, vermicelli, egg macaroni, noodles, egg noodles, plain noodles or other similar macaroni or noodles product when such product does not conform to Federal Standards as described above.

(2) It is unfair trade practice to sell or offer for sale, advertise, describe, brand, label or otherwise represent any macaroni or noodle product as being a semolina or farina product when such is not true in fact.

(3) It is unfair trade practice to represent a product as being egg macaroni, egg noodles, etc., unless the product contains not less than 5.5 percent egg solids on the dry basis.

(4) It is unfair trade practice to use yellow coloring in, or yellow transparent containers for, any macaroni, noodle or related product, in such a manner as to import or imply to purchasers or the consuming public that such a product contains egg in greater proportion than is in fact present.

(5) It is unfair trade practice to use any food ingredient contributing yellow color for the purpose, or with the effect, of misleading or deceiving the purchasing public.

(6) In case additional food ingredients, not including those specified by Federal definition, are used in macaroni, noodles, or related products, full and non-deceptive disclosure of such fact should be made; it is unfair trade practice to conceal, or fail to disclose, or to misrepresent, directly or indirectly, the proportion of such food ingredients present in said macaroni, noodles, or related products, with the capacity and tendency or effect of misleading or deceiving purchasers, prospective purchasers, or the consuming public.

Semolina, the preferred ingredient in the manufacture of macaroni, consists of the purified middlings of durum wheat. It has more gluten and less starch than farina, purified middlings of hard wheat other than durum. Some manufacturers use flour in combination with semolina or farina or with both. Macaroni comes in the shape of hollow tubes about ¼ inch in diameter. There are different names for all of the different widths of macaroni products. Macaroni 3/32 inch in diameter is known to the trade as "fovantini" or "maccaroncelli;" if it is ½ inch in diameter it is known as "zetoni." Between these two sizes are innumerable sizes and forms such as alphabets, stars, bows, cockle shells, butterflies, daisies, elbows and hundreds of other shapes.

Solid rods of macaroni product 3/32 inch in diameter are known as spaghetti. Vermicelli is only a third as thick. The standard shape of noodles is the ribbon.

53. Trade Practice Rules for Macaroni, Noodles and Related Products Industry, Federal Trade Commission, Washington, D.C., July 7, 1938.

Macaroni products are good sources of food energy. A pound of dry macaroni furnishes about 1,600 calories. This is equivalent to about 100 calories for ¾ cup of plain boiled macaroni. Macaroni contains some protein, but the protein it furnishes cannot be relied upon to build and replace body tissue. Egg noodles have a slightly greater food value because of their egg ingredients. The egg, however, is a small proportion of the product; of noodles with the minimum 5.5 per cent egg content an 8 ounce package contains the equivalent of about one whole egg.

The composition of accepted brands of macaroni and noodles and related products is given in table 10.

The listed products of the following firms stand accepted:

Boston Food Products Company, Boston.

PRUDENCE BRAND MACARONI WITH BEEF SAUCE, cooked macaroni seasoned with tomato puree, prepared from tomatoes, hydrolyzed wheat protein, onion, beef, olive oil, cracker meal and vegetable fat.

Fontana Food Products Company, San Francisco.

CEL-MAC BRAND MACARONI PRODUCTS, same as Fontana's Brand Macaroni.

FONTANA'S BRAND MACARONI, prepared from durum wheat semolina and water

FONTANA'S BRAND MACARONI ALPHABETS, same as Fontana's Brand Macaroni.

FONTANA'S BRAND BUTTERFLIES, same as Fontana's Brand Macaroni.

FONTANA'S BRAND DAISIES, same as Fontana's Brand Macaroni.

FONTANA'S BRAND SEA SHELLS, same as Fontana's Brand Macaroni.

FONTANA'S BRAND MACARONI, ELBOW, same as Fontana's Brand Macaroni.

FONTANA'S BRAND SALAD MACARONI, same as Fontana's Brand Macaroni.

FONTANA'S BRAND SPAGHETTI, same as Fontana's Brand Macaroni.

FONTANA'S BRAND SPAGHETTI, ELBOW, same as Fontana's Brand Macaroni.

FONTANA'S BRAND EGG NOODLES NARROW, noodle strips prepared from flour, egg yolk and water.

FONTANA'S BRAND EGG NOODLES WIDE, same as Fontana's Brand Egg Noodles Narrow.

FONTANA'S BRAND VERMICELLI FIDEOS, same as Fontana's Brand Egg Noodles.

Golden Gate Macaroni Company, Inc., San Francisco.

GOLDEN GATE MACARONI, products of various sizes and shapes, prepared from durum wheat semolina and water.

GOLDEN GATE BRAND EGG NOODLES, prepared from flour, egg yolk and water.

Grocery Store Products Company, New York, products distributed by Foulds Milling Company, Libertyville, Ill.

FOULD'S BRAND MACARONI prepared from durum wheat semolina, water and salt.

FOULDS' BRAND MACARONI, ELBOW, same as Foulds' Brand Macaroni.

FOULDS' BRAND SPAGHETTI, same as Foulds' Brand Macaroni.

FOULDS' BRAND SPAGHETTI, ELBOW, same as Foulds' Brand Macaroni.

FOULDS' BRAND EGG NOODLES, ALPHABETS, noodles prepared from durum flour, egg yolk and water.

Products distributed by Golden Age Corporation, Libertyville, Ill.

GOLDEN AGE BRAND MACARONI, same as Foulds' Brand Macaroni.

GOLDEN AGE BRAND SPAGHETTI, same as Foulds' Brand Macaroni.

GOLDEN AGE BRAND EGG NOODLES, same as Foulds' Brand Egg Noodles.

TABLE 10.—*Composition of Macaroni, Egg Noodles, and Similar Products (Submitted by Manufacturers)*

Product	Moisture, %	Total Solids, %	Ash, %	Fat,* %	Lipoid Phosphoric Acid,† %	Whole Egg Solids,‡ %	Protein, %	Crude Fiber, %	Carbo-hydrates,§ %	Calories	
										Per Gm.	Per Oz.
Macaroni, spaghetti and vermicelli, plain	10.0-13.0	86.6-90.0	0.6-0.7	0.2-1.8	....	....	12.4-13.6‖	0.2-0.6	72.3-74.9	3.4-3.6	97-102
Macaroni, with milk	10.8	89.2	0.8	2.0	....	.....	15.8¶	0.3	70.8	3.6	102
Macaroni, with yeast and soya bean flour	10.7	89.3	0.8	5.0	....	......	20.2¶	0.6	62.3	3.7	105
Macaroni, cooked with beef sauce	81.8	18.2	1.2	2.0	....	......	3.6¶	0.1	11.3	0.8	23
Egg noodles	9.0-12.4	87.6-91.0	0.6-1.6	......	0.12-0.15	5.8-8.3	13.0-20.0¶	0.2-0.5	67.1-71.7	3.7-3.8	105-108

* Ether extract.

† Dry basis.

‡ Calculated according to the following formula: Whole egg solids = (percentage of lipoid P_2O_5 in sample [dry basis] times 1.1, to correct for loss of lipoid P_2O_5 in manufacturing process, minus 0.055, the average lipoid P_2O_5 of wheat flours) times 75.5 (the factor for lipoid P_2O_5 of whole eggs in noodles [dry basis]). The formula was taken from "Official and Tentative Methods of Analysis of the Association of Official Agricultural Chemists," ed. 3, Washington, D. C., Association of Official Agricultural Chemists, 1930, p. 182.

§ Other than crude fiber (by difference).

‖ N × 5.7.

¶ N × 6.25.

Miller's Food Products, Inc., Los Angeles.

MILLER'S BRAND SPAGHETTI, prepared from semolina and water.

MILLER'S BRAND MACARONI, same as Miller's Brand Spaghetti.

MILLER'S BRAND MACARONI PRODUCTS OF VARIOUS SIZES AND SHAPES, same as Miller's Brand Spaghetti.

MILLER'S BRAND EGG NOODLES, noodles prepared from hard wheat flour, water, egg yolks and salt.

Minnesota Macaroni Company, St. Paul.

JENNY LEE'S BRAND MARCARONI, ALPHABETS, prepared from durum semolina and water.

JENNY LEE'S BRAND MACARONI, QUICKIES, same as Jenny Lee's Brand Macaroni, Alphabets, except that the inside and outside diameter of the macaroni is smaller, producing a product which cooks in less time.

JENNY LEE'S BRAND MACARONI, LONG, same as Jenny Lee's Brand Macaroni, Alphabets.

JENNY LEE'S BRAND MACARONI, RINGS, same as Jenny Lee's Brand Macaroni, Alphabets.

JENNY LEE'S BRAND MACARONI, SHELLS, same as Jenny Lee's Brand Macaroni, Alphabets.

JENNY LEE'S BRAND SPAGHETTI, LONG, same as Jenny Lee's Brand Macaroni, Alphabets.

JENNY LEE'S BRAND SPAGHETTI, ELBOW, same as Jenny Lee's Brand Macaroni, Alphabets.

MINNESOTA BRAND AMBEROLLS, QUICK COOKING, ELBOW MACARONI, prepared from durum semolina and water.

MINNESOTA BRAND ELBOW MACARONI, AMBEROLLS, prepared from durum semolina and water.

Nouron Products Corporation, New York.

NOURON, dried granules from whole durum wheat flour, soy beans and dried egg yolk.

Prince Macaroni Mfg. Co., Boston.

VETA-RONI of various shapes, macaroni-like product prepared from durum wheat semolina, soy bean flour, water, yeast and salt.

The Quaker Oats Company, Chicago.

QUAKER BRAND MILK MACARONI, prepared from durum semolina, powdered whole milk and water.

QUAKER BRAND QUICK COOKING MILK MACARONI, thin-walled short macaroni strips prepared from durum semolina, powdered whole milk and water.

QUAKER BRAND QUICK COOKING MILK SPAGHETTI, same as Quaker Brand Quick Cooking Milk Macaroni.

Tharinger Macaroni Company, Milwaukee.

WHITE PEARL BRAND MACARONI, prepared from durum patent flour, durum semolina and water.

WHITE PEARL BRAND MACARONI, ALPHABETS, same as White Pearl Brand Macaroni.

WHITE PEARL BRAND MACARONI, NOVELTIES, same as White Pearl Brand Macaroni.

WHITE PEARL BRAND MACARONI, RINGS, same as White Pearl Brand Macaroni.

MINNESOTA BRAND MACARONI, ALPHABETS, prepared from durum semolina and water.

MINNESOTA BRAND MACARONI, LONG, same as Minnesota Brand Macaroni, Alphabets.

MINNESOTA BRAND MACARONI, RINGS, same as Minnesota Brand Macaroni, Alphabets.

MINNESOTA BRAND MACARONI, SHELLS, same as Minnesota Brand Macaroni, Alphabets.

MINNESOTA BRAND LONG SPAGHETTI, same as Minnesota Brand Macaroni, Alphabets.

MINNESOTA BRAND SPAGETS-ELBOW SPAGHETTI, same as Minnesota Brand Macaroni, Alphabets.

MINNESOTA BRAND VERMICELLI, same as Minnesota Brand Macaroni, Alphabets.

JENNY LEE'S BRAND EGG NOODLES, prepared from durum flour and egg yolk.

MINNESOTA BRAND EGG NOODLES, BROAD, same as Jenny Lee's Brand Egg Noodles.

MINNESOTA BRAND EGG NOODLES, FINE OR CHOW MEIN STYLE, same as Jenny Lee's Brand Egg Noodles.

MINNESOTA BRAND EGG NOODLES, MEDIUM WIDE, same as Jenny Lee's Brand Egg Noodles.

WHITE PEARL BRAND MACARONI, TASTY BENDS, same as White Pearl Brand Macaroni.

WHITE PEARL BRAND SPAGHETTI, same as White Pearl Brand Macaroni.

WHITE PEARL BRAND CUT SPAGHETTI, same as White Pearl Brand Macaroni.

WHITE PEARL BRAND VERMICELLI, same as White Pearl Brand Macaroni.

WHITE PEARL BRAND EGG NOODLES, NARROW, noodles prepared from durum patent wheat flour, durum semolina, egg yolk and water.

WHITE PEARL BRAND EGG NOODLES, WIDE, same as White Pearl Brand Egg Noodles Narrow.

The following firms distribute under their own labels products purchased from manufacturers of accepted products now privileged to use the Seal of Acceptance. The labels and advertising conform to the Rules and Decisions of the Council.

Twin City Wholesale Grocer Co., St. Paul, Minneapolis and Fargo, N. D.

FAIRWAY BRAND MACARONI RINGS, prepared from durum semolina and water.

FAIRWAY BRAND, MACARONI, LONG, same as Fairway Brand Macaroni Rings.

FAIRWAY BRAND MACARONI, SHELLS, same as Fairway Brand Macaroni Rings.

FAIRWAY BRAND MACARONI, ELBOW, same as Fairway Brand Macaroni rings.

FAIRWAY BRAND SPAGHETTI, ELBOW, same as Fairway Brand Macaroni Rings.

FAIRWAY BRAND SPAGHETTI, LONG, same as Fairway Brand Macaroni Rings.

FAIRWAY BRAND EGG NOODLES, MEDIUM, prepared from durum flour and egg yolk.

FAIRWAY BRAND EGG NOODLES, BROAD, same as Fairway Brand Macaroni Rings.

Twin Ports Wholesale Grocer Co., Duluth, Minn., and Superior, Wis.

FAIRWAY BRAND MACARONI RINGS, prepared from durum semolina and water.

FAIRWAY BRAND, MACARONI, LONG, same as Fairway Brand Macaroni Rings.

FAIRWAY BRAND MACARONI, SHELLS, same as Fairway Brand Macaroni Rings.

FAIRWAY BRAND MACARONI, ELBOW, same as Fairway Brand Macaroni rings.

FAIRWAY BRAND SPAGHETTI, ELBOW, same as Fairway Brand Macaroni Rings.

FAIRWAY BRAND SPAGHETTI, LONG, same as Fairway Brand Macaroni Rings.

FAIRWAY BRAND EGG NOODLES, MEDIUM, prepared from durum flour and egg yolk.

FAIRWAY BRAND EGG NOODLES, BROAD, same as Fairway Brand Egg Noodles, Medium.

Wood County Grocery Co., Wisconsin Rapids, Wis.

FAIRWAY BRAND MACARONI RINGS, prepared from durum semolina and water.

FAIRWAY BRAND MACARONI, LONG, same as Fairway Brand Macaroni Rings.

FAIRWAY BRAND MACARONI, SHELLS, same as Fairway Brand Macaroni Rings.

FAIRWAY BRAND MACARONI, ELBOW, same as Fairway Brand Macaroni Rings.

FAIRWAY BRAND SPAGHETTI, ELBOW, same as Fairway Brand Macaroni Rings.

FAIRWAY BRAND SPAGHETTI, LONG, same as Fairway Brand Macaroni Rings.

FAIRWAY BRAND EGG NOODLES, MEDIUM, prepared from durum flour and egg yolk.

FAIRWAY BRAND EGG NOODLES, BROAD, same as Fairway Brand Egg Noodles, Medium.

CORN PRODUCTS

Corn, also known as maize, is one of the important cereal crops of the United States. Two and one-half billion bushels of corn were harvested in the United States in 1938, most of which was grown in Iowa, Illinois, Ohio, Indiana, Minnesota, Nebraska and Missouri.

The corn kernel is composed of hull, endosperm and embryo. The hull constitutes about 5 per cent of the whole kernel. It is made up in part of fiber, wood gums and pentosans but contains only small quantities of starches, fats and proteins. The endosperm consists of the aleurone layer, a single layer of cells making up the outer layer of the endosperm; the starchy endosperm, which includes the starch of the crown and the tip, and the horny endosperm. The endosperm constitutes over 80 per cent of the kernel and is composed principally of starch. The embryo, or germ, makes up approximately 10 per cent of the entire kernel. About a third of the embryo is fat, from which corn oil is derived.

Numerous varieties of corn are grown. These may be classified [54] as dent, flint, pop, soft, sweet, soft-sweet and pod. For commerce, corn is divided into the following three classes according to official federal standards for grain: class I yellow corn, class II white corn and class III mixed corn.

The composition of corn varies with the variety; a representative analysis is as follows: Moisture 11 per cent, protein 10 per cent, fat (ether extract) 4 per cent, crude fiber 2 per cent, carbohydrates other than crude fiber (by difference) 72 per cent and ash 1 per cent.[55]

Corn has wide usage and consumption as a food in its green, or milky, state, and also as commercially canned corn kernels, cream style corn and corn on the cob. Corn is also the raw material for numerous other products, such as corn meal,

54. Revised United States Standards for Corn, Northwestern Miller (sect. 2) 198: 16 (April 26) 1939.

55. Leach, A. E.: Food Inspection and Analysis ed. 4, New York, John Wiley & Sons, 1920.

hominy, corn starch, dextrose, syrups and corn oil.[56] It is also used in the manufacture of breakfast foods such as cornflakes and puffed corn.

According to federal regulations,[85] corn meal is the meal obtained from the grinding of corn and contains not over 14 per cent moisture, not less than 1.12 per cent nitrogen and not more than 1.6 per cent ash. Corn meal is prepared either by grinding the entire kernel and sifting out only the larger particles of bran (old process) or by grinding the endosperm after the germ and most of the bran have been removed (new process). The significant difference in composition between (1) the kernel as a whole, (2) the old process corn meal and (3) the new process corn meal is that the new process corn meal contains less ash, less fiber and less fat than the old process corn meal or the corn kernel. The composition of old process corn meal and of the entire corn kernel is approximately the same.[57]

The whole kernel corn meal is commonly stone ground, often on a small scale; the degerminated corn meal is roller ground, on a large scale and by a system analogous to the gradual reduction process of milling wheat flour. Corn meal may be white or yellow, the preference in some sections being for one and in other sections for the other. The inclusion of the germ, or embryo, favors rapid deterioration and lowers the keeping quality of the product.

Hominy is a product of ancient origin; it was prepared by the aborigines, who used wood ashes as the decorticating agent. At present, it is prepared in large canning establishments by treating the whole corn kernels with dilute lye, boiling the kernels, washing off the excess lye and subsequently cooking the mass until tender. The kernels swell during this treatment to a considerable size, which is associated with the distortion of the starch granules. Hominy is ground to varying degrees of fineness to form grits. Both hominy and grits are consumed chiefly in the Southern States.

Corn starch is prepared from the endosperm and hulls after the kernel has been separated, by soaking in water, into its principal parts: hulls, germ and endosperm. The germs, on account of the oil which they contain, float on the liquid, while the hulls and starch granules, being heavier, settle to the bottom. The mass on the bottom is drawn off, and corn starch is obtained.

The composition of accepted corn products listed in this section is given in table 11.

---

56. The consideration of canned corn as a vegetable food is discussed in section XI, entitled "Vegetables." The consideration of dextrose and syrup as foods is discussed in section X, entitled "Sugars and Syrups." The consideration of corn oil as a food is discussed in section I, entitled "Fats and Oils and their Products."

57. Sherman, H. C.: Food Products, ed. 3, New York, The Macmillan Company, 1933, p. 305.

TABLE 11.—*Percentage Composition of Corn Products (Submitted by Manufacturers)*

Product	Moisture, %	Total Solids, %	Ash, %	Fat,* %	Protein,† %	Crude Fiber, %	Carbo-hydrates,‡ %	Calories Per Gm.	Calories Per Oz.
Canned corn, cream style	74.6	25.4	1.1	0.9	2.6	0.3	20.5	1	28.4
Canned corn, whole kernel	72.0	28.0	1.0	1.4	3.4	0.6	21.6	1.1	31
Corn meal, white	11.5-14.5	85.5-88.5	0.3-1.5	0.5-3.2	7.2-10.6	0.4-3.0	69.9-78.5	3.4-3.6	97-102
Corn meal, yellow	11.8-13.5	86.5-88.2	0.3-1.5	0.5-1.7	8.3-9.6	0.4-1.1	74.9-78.5	3.5	99
Corn meal mush, canned	83.6	16.3	0.7	0.1	1.8	0.4	13.4	0.6	18
Corn starch	12.5	87.5	0.15	0.1	0.3	0.0	86.9	3.5	99
Hominy, grits	12.4	87.6	0.3	0.4	9.4	0.7	76.8	3.5	99
Hominy, pearled	11.6	88.4	0.5	1.0	9.1	0.6	77.2	3.5	99
Old type corn meal, yellow	10.4	89.6	1.3	4.5	7.9	1.8	74.1	3 69	105
Expanded corn flavored with cheese	3.3	96.7	2.9	24.1	10.2	1.2	58.3	4.91	139

* Ether extract.
† Nitrogen × 6.25.
‡ Total carbohydrates (by difference).

The listed corn products of the following firms stand accepted:

Acme-Evans Company, Indianapolis.
EVAN'S E-Z BAKE BRAND WHITE CORN MEAL.
EVAN'S E-Z BAKE BRAND YELLOW CORN MEAL.

Bewley Mills, Fort Worth, Texas.
BEWLEY'S BLUE RIBBON BRAND CREAM CORN MEAL.

Corn Products Refining Company, New York.
ARGO BRAND CORNSTARCH, a refined corn starch.

Fisher Flouring Mills Co., Incorporated, Seattle.
FISHER'S BRAND WHITE CORN MEAL.
FISHER'S BRAND YELLOW CORN MEAL.

General Mills Inc., Minneapolis.
GOLD MEDAL WHITE CORN MEAL.
GOLD MEDAL WHITE CREAM MEAL, finely granulated corn meal.
GOLD MEDAL YELLOW CORN MEAL.
GOLD MEDAL YELLOW CREAM MEAL, finely granulated corn meal.

New Foods, Incorporated, Chicago.
TRIX, toasted expanded steamed cooked corn grits, coated with cheese flavoring (a mixture of cocoanut oil, processed cheese and certified color).

The Quaker Oats Company, Chicago.
QUAKER BRAND WHITE CORN MEAL.
QUAKER BRAND YELLOW CORN MEAL.
QUAKER BRAND HOMINY GRITS, coarse white corn grits.
QUAKER BRAND PEARL HOMINY, pearled white corn grits.

Scott County Milling Company, Sikeston, Mo.
BM MCo BRAND CREAM CORN MEAL, finely granulated white corn meal.

Streator Canning Company, Streator, Ill.
MORNING DEW BRAND CORN MEAL MUSH, canned, steam-cooked mush made from a mixture of whole kernel yellow corn and degerminated yellow corn meal.

Texas Star Flour Mills, Galveston, Texas.
AMBROSIA BRAND CREAM CORN MEAL, finely granulated white corn meal.
TIDAL WAVE BRAND CORN MEAL, white corn meal.

Welfare and Recreational Association of Public Buildings and Grounds, Inc., Washington, D. C.
PIERCE MILL YELLOW CORN MEAL, old type corn meal obtained by crushing corn between stones and bolting out most of the bran.

RICE PRODUCTS

Rice cereal is Asiatic both as to origin and as to the chief proportion of cultivation. Some rice is cultivated in the United States, particularly in Louisiana, Texas, Arkansas and California, where it is a crop of major importance. Wild rice is grown in Minnesota.

The rice kernel is enveloped by a harsh siliceous palet, commonly known as the hull, or husk. The palet is so harsh and indigestible that it is unsuited even for animal food. For this reason rough threshed rice is not available. The palet is removed from the rice kernel by means of a "paddy" machine. The product thus obtained is known as brown rice. The removal

of the outer palet of the whole rice kernel inevitably removes some of the bran, as the palet is closely adherent to the seed. Brown rice, which retains some of the bran, more nearly resembles the whole rice kernel than any other type of rice now available.

Brown rice not marketed as such is decorticated by passing through machinery. This process removes the branny layers up to the starchy endosperm. The by-product of this operation is rice bran. The decorticated rice is then polished. The process of polishing rubs off irregularities of the surface and leaves the kernel in its finished form, the white rice of commerce. Polished rice is sometimes treated with a mixture of glucose and talc to improve its appearance. The amount of glucose and talc used

TABLE 12.—*Percentage Composition of Rice and Rice Products* *

Product	Moisture, %	Protein, %	Fat, %	Pentosans, %	Carbohydrates by Difference, %	Fiber, %	Ash, %
Rough rice....	11.2	7.5	1.6	0.0	65.6	8.7	5.4
Brown rice†...	12.3	8.6	1.8	2.4	75.1	1.0	1.2
Fancy head...	12.1	8.2	0.2	1.7	78.9	0.3	0.3
Second head...	12.0	7.9	0.3	1.7	79.1	0.3	0.4
Screenings..	12.7	7.7	0.3	1.8	78.5	0.3	0.5
Hulls...	6.6	2.6	0.5	18.2	35.6	36.0	18.7
Bran....	9.6	13.4	10.6	9.9	44.1	11.7	10.6
Polish......	8.3	12.8	10.8	4.4	58.4	3.3	6.4

* Data obtained from Winton, A. L., and Winton, K. B.: The Structure and Composition of Foods, New York, John Wiley & Sons, Inc., 1932, vol. 1, p. 138.
† From paddy machine.

(about 1 part talc and 2 parts of glucose to one thousand parts of rice) is not sufficient to alter appreciably the percentages of the constituents determined. Polished rice is then screened in order to separate the broken kernels from the more attractive whole kernels. Rice screenings are usually marketed as such or utilized in the manufacture of other mill products.

Terms describing various rice products such as rice bran, rice meal and rice polishings have no definite meaning because the milling practices vary from one country to another and from one mill to another. All represent the products of successive abrasions of the exterior of the grain, which are "cut" into various "streams" according to the judgment of the operators.

The composition of these various milling products is given in table 12. As would be expected, brown rice contains more ash and fiber than white rice, and rice bran and rice polishings contain proportionately more ash, protein and fiber.

The removal of the outer palets and of the branny layers removes not only the minerals but vitamin B_1 as well. The

extent of the decrease in vitamin B_1 is indicated by the values for the thiamin content of rice as given by Williams and Spies:[58]

Product	Thiamin, Micrograms Per 100 Gm.
Polished rice	50
Unpolished rice	220
Cured or brown rice	250
Rice bran	200-375
Rice polishings	200-375

It has been known for some time, especially in Japan and the Philippines, that a diet consisting chiefly of polished rice is likely to result in the disease beriberi. In pure white polished rice the vitamin B_1 is so far reduced as to be practically negligible. For these reasons cured, or brown, rice has been introduced into the grocery trade in this country. Like whole wheat flour, brown rice does not keep as well as white rice; for this reason it usually costs more.

The Council on Foods has accepted several rice products, the composition of which is given in table 13.

The listed rice products of the following firms stand accepted:

Grocery Store Products Company, New York, product distributed by Cream of Rice Company, New York.

CREAM OF RICE, a mixture of heat-treated granulated polished rice and powdered skimmed milk (4.76 per cent by weight).

H. J. Heinz Company, Pittsburgh.

HEINZ BRAND RICE FLAKES WITH RICE HULL CELLULOSE, a mixture of toasted flaked cooked polished rice and rice hull cellulose (7 per cent by weight of milled rice) made from treated rice hulls, with added salt, yeast and milk sugar.

Standard Rice Company, Inc., Houston, Texas.

WHITE HOUSE BRAND RICE, heat-treated polished rice.

WHITE HOUSE BRAND RICENA, same as white house brand rice except that the broken grains are crushed to make ricena.

WHITE HOUSE BRAND NATURAL BROWN RICE, heat-treated hulled unpolished rice.

WHITE HOUSE BRAND NATURAL BROWN RICE FLAKES, toasted flaked cooked brown rice flavored with sugar, salt and malt syrup.

WHITE HOUSE BRAND RICE FLOUR, ground and bolted polished rice.

The Quaker Oats Company, Chicago.

QUAKER BRAND PUFFED RICE, partially dried puffed cooked polished rice.

OTHER GRAIN PRODUCTS

Barley Products

The most commonly cultivated barleys belong to two or three different species of the genus Hordeum. The grain is about the size of wheat but differs from wheat in composition. In general barley contains less protein and ash and more starch than wheat.

Barley is prepared for human use chiefly in the form of pearled barley and patent barley flour. In making pearled barley the germ and most of the bran are removed. The struc-

58. Williams, R. R., and Spies, T. D.: Vitamin B_1 (Thiamin) and Its Use in Medicine, New York, The Macmillan Company, 1938.

TABLE 13.—*Percentage Composition of Rice Products (Submitted by Manufacturers)*

Product, Type of Rice	Moisture, %	Total Solids, %	Ash, %	Fat, %	Protein,‖ %	Crude Fiber, %	Carbo-hydrates,¶ %	Calories Per Gm.	Calories Per Oz.
Natural brown	13.0	87.0	1.1	2.2	6.3	0.9	76.5	3.51	100
Broken white *	11.9	88.1	0.4	0.5	6.2	0.3	80.7	3.52	100
White	11.3	88.7	0.4	0.6	6.1	0.3	81.5	3.55	101
Flakes †	1.5	98.5	3.1	0.3	7.8	4.4	82.9	3.66	104
Flakes, natural	3.1	96.9	4.3	2.0	8.5	0.7	81.4	3.78	107
Flour	9.3	90.7	0.8	0.7	6.7	0.6	81.9	3.61	103
Puffed	2.0	98.0	0.4	0.4	5.9	0.5	90.8	3.90	111
Granulated ‡	9.8	90.2	1.0	0.8	8.6	0.4	79.4	3.59	102

* Crushed, broken kernels obtained from milling of white rice.
† Added rice cellulose, yeast, salt and milk sugar.
‡ Granulated polished rice with powdered skimmed milk (4.76 per cent by weight).
§ Ether extract.
‖ Protein factor N × 6.25 used on account of the skimmed milk content of the product.
¶ Other than crude fiber (by difference).

ture of the barley kernel favors decortication because of the shallow groove. Patent barley flour is the finely ground product prepared from barley flour. At present there are no federal standards for pearled barley or for patent barley flour. The Council on Foods has accepted one brand of pearled barley, the composition of which is given in table 14.

Whole barley is used for human food only in the roasted form, as a substitute for coffee. Malted barley is sprouted and steamed whole barley from which the radicle has been removed. This malted barley is rich in an enzyme which digests starch in the production of maltose. The characteristic enzyme of malted barley is commonly called malt diastase. On account of its high diastatic power, barley malt is chiefly used in the fermentation industry as a means of digesting the starch of the barley itself and also of other grains into fermentable sugar.

Oats

Oats belong to the genus Avena sativa. The culture of oats is widely distributed over Europe and America, and the grain generally is used both as human food and as food for farm animals, especially horses. Oats are sharply distinguished from wheat and barley by their downy appearance and longer, narrower kernels.

Whole oats, ground or unground, because of their harsh nature can be eaten only by animals. For human consumption it is necessary to remove the chaffy husk. This is done in preparing rolled oats, and the remaining kernel is sold with or without cooking or steaming. The greater part of the germ and a considerable part of the outer layers of the kernel remain after the husk is removed. Thus rolled oats rank among the most nutritious and palatable of cereal foods for human consumption. Oatmeal also is prepared from the hull of the oats. According to federal standards oatmeal contains not more than 12 per cent moisture, not more than 1.5 per cent crude fiber, not less than 2.24 per cent nitrogen and not more than 2.2 per cent ash.

Oatmeal and rolled oats are relatively rich in fat as well as in protein and are somewhat more concentrated as to both energy value and protein content than are other staple grain products. The following average composition of a 100 Gm. portion of dried oatmeal may be expected: protein 17 Gm., carbohydrates 66 Gm., fat 7.3 Gm., calcium 69 mg., phosphorus 392 mg. and iron 3.8 mg. A 100 Gm. portion would also provide 140 international units of vitamin B_1 and 398 calories.

Osborne and Mendel[59] found the proteins of barley, oats, rye and wheat to be about equally efficient in promoting and supporting growth.

The composition of oat products accepted by the Council is given in table 14.

---

59. Osborne, T. H., and Mendel, L. B.: Nutritive Value of the Proteins of the Barley, Oat, Rye and Wheat Kernels, J. Biol. Chem. 41: 275, 1920.

TABLE 14.—*Composition of Barley, Oats and Rye Products (Submitted by Manufacturers)*

Product	Moisture, %	Total Solids, %	Ash, %	Fat,* %	Protein,† %	Crude Fiber, %	Carbohydrates,‡ %	Calories	
								Per Gm.	Per Oz.
Barley, pearled	9.9	90.1	0.7	0.7	9.4	0.5	78.8	3.59	102
Oat flakes	8.0	92.0	2.0	7.3	14.0	1.3	67.4	3.91	111
Rye—									
Rye bread flour	11.3	88.7	1.6	1.9	13.4	2.1	69.7	3.50	99
Rye wafers	5.8	94.2	2.8	1.8	12.8	2.3	74.5	3.65	104

* Ether extract.
† Nitrogen × 5.83.
‡ Other than crude fiber (by difference).

Rye

Although not of the same genus, rye is more closely related to wheat both structurally and as regards composition than any other cereal. The rye kernel is greenish brown and more slender than the wheat kernel. The one marked distinction in the chemical composition of rye and wheat is the failure of the rye protein to yield gluten. Gluten is the protein constituent that forms the framework of bread, biscuits, cakes and most other baked products made with wheat flour. Bread made entirely with rye flour is a dark heavy loaf known as pumpernickel. Rye is grown principally in Northern European countries and is used generally in the form of rye flour. In breadmaking qualities rye flour approaches wheat flour more closely than the ground meal of any other grain. In this country only a small amount of the rye grown is used in the manufacture of rye flour.

Rye flour, according to federal standards, is the finely ground product made by bolting rye meal. It contains not less than 1.36 per cent nitrogen and not more than 1.25 per cent ash. The idea that rye bread is more nutritious than wheat bread is widespread. The average results of analyses of American rye breads as tabulated by Atwater and Bryant[60] show their average composition to be as follows: water 36 per cent, protein ($N \times 6.25$) 9 per cent, fat 0.6 per cent, crude fiber 0.5 per cent and ash 1.5 per cent. Compared with the composition of white bread, as given in table 6, the proportions of water, protein, fat and ash are about the same in both kinds of bread. Whole rye bread (pumpernickel), according to Atwater and Bryant, may be expected to have the following composition: water 51 per cent, protein 12 per cent, fat 0.6 per cent, crude fiber 1.2 per cent and ash 0.9 per cent.

Rye is a less significant source of vitamin B_1 than either whole wheat or oatmeal. According to Williams and Spies the vitamin B_1 content of rye and rye products per hundred grams is as follows: rye grain 200 micrograms of vitamin B_1, rye flour 170 micrograms and rye germ 170 micrograms. Although the vitamin B_1 content of rye flour is larger than that of patent wheat flour (50 mg. of vitamin B_1 per hundred grams), it is customary for commercial bakers to mix rye flour with wheat flour in order to improve the loaf volume. As there are no federal standards regarding rye bread, the proportions of rye flour to wheat flour vary from baker to baker and from city to city. For this reason the vitamin B_1 content of rye flour is no indication of the vitamin B_1 content of rye bread unless the proportion of rye to wheat flour is given on the label.

Osborne[61] investigated the proteins of rye and reported that they are similar to, but not identical with, those of wheat.

60. Atwater, W. O., and Bryant, A. P.: The Chemical Composition of American Food Materials, revised edition, Bulletin 28, United States Department of Agriculture, Office of Experiment Stations, 1906.
61. Osborne, T. H.: The Proteids of the Rye Kernel, J. Am. Chem. Soc. 17:429, 1895.

French and Mattill[62] reported that the biologic value of the proteins of rye bread is of the same order as that of white bread and whole wheat bread, as determined on human subjects.

The composition of rye products accepted by the Council on Foods is given in table 14.

The listed barley, oat and rye products of the following firms stand accepted:

The Fisher Flouring Mills Company, Seattle.

FISHER'S BRAND RYE FLOUR, milled whole rye grain minus about 10 per cent of the coarse material.

Hecker-H-O Company, Inc., Buffalo.

H-O-HORNBY'S BRAND OATS (Regular H-O Oats), lightly toasted cooked oat flakes.

H-O BRAND OATS (QUICK) NEW STYLE, the same as H-O Hornby's Brand Oats except that the flakes are cut smaller and rolled thinner for quick cooking.

The Quaker Oats Company, Chicago.

SCOTCH BRAND PEARLED BARLEY, barley pearled to the desired size and practically free of barley bran.

Paul Schulze Biscuit Company, Chicago.

RYE BRACKLE WAFERS, baked, partially dried wafers consisting of rye grain from which a portion of the endosperm is removed, with salt and water to make a dough.

---

62. French, R. B., and Mattill, H. A.: The Biological Value of the Proteins of White, Wheat and Rye Breads, Cereal Chem. **12**: 365 (July) 1935.

SECTION VI

Preparations Used in the Feeding of Infants

Milk is the principal food for babies, but certain other foods are valuable supplements as the infant develops. Carbohydrate supplements are customary items of the diet of the bottle-fed infant at an early age. Both breast-fed and bottle-fed infants are given orange juice (or some other source of vitamin C) and cod liver oil (or some other source of vitamins A and D) from the first month of life. Cereal preparations and finely divided fruit and vegetable preparations are also included in the infant's diet at an early age. Within the last two decades, a great many special preparations for infant feeding have been marketed, many of which have enhanced vitamin potency and mineral content. Those which stand accepted by the Council on Foods are here discussed. For additional information on milk, per se, on fruit juices, including tomato juice, and on sugars and cereals, the reader is referred to sections III, V, VIII and X of this book.

The Council does not accept products intended for infant feeding if their labels or advertising distributed to the public contain printed instructions for feeding of infants. The following statement has been adopted as a decision of the Council.

Feeding Formulas for Infants in Advertising.—The feeding of the baby during the first year is of fundamental importance to its health. Wrong feeding may even be fatally disastrous. For this reason every infant, the breast fed and doubly so the artificially fed, should be under the supervision of a physician experienced and skilled in the care and feeding of infants.

The feeding of an infant by routine feeding formulas and instructions distributed by food manufacturers, or according to directions, printed material, or advice of any person other than the attending physician who can personally observe the condition of the baby may seriously endanger the health of the infant.

The promulgation of feeding formulas in advertising to the public is considered to be in conflict with the best experience, authoritative judgment, and basic principles in infant feeding and is not permissible. No objection is taken to published directions for the preparation of mixtures for use in infant feeding.

Also, no objection is taken to statements concerning the feeding of sieved or comminuted fruits and vegetables when these statements conform to standards set by the Council's published reports and decisions.

MILK PREPARATIONS

The milk of every mammal is specific for its young. To this rule human milk is no exception. It is preeminently adapted to the human infant; therefore, the goal of all effort in the artificial feeding of infants is to adapt the milk of another species to the human infant. Cow's milk when used for infant feeding is modified to make it more nearly like human milk. The average composition of human and of cow's milk is as follows:

Average Composition of Human and of Cow's Milk

Milk	Water, %	Protein, %	Fat, %	Lactose, %	Ash, %
Human	87.4	1.5	4.0	6.9	0.2
Cow's	87.0	3.3	3.5	5.0	0.7

Comparison of Human Milk and Cow's Milk.—A comparison of the chemical composition of human and of cow's milk shows that the outstanding differences are the higher protein and ash contents and the lower lactose content of cow's milk. Further dissimilarities that do not appear in the analyses just given lie in the relative proportions of the two principal proteins, in the proportions of the ash constituents, in the composition of the fat and possibly in the size of the fat particles and in the vitamin content.

The two chief proteins of milk are casein, which forms the curd of coagulated milk, and lactalbumin, which is found in the whey. In cow's milk the ratio of casein to lactalbumin is approximately 6 to 1, while in human milk this ratio is approximately 0.6 to 1. It is obvious, then, that casein is present in cow's milk in considerably greater amounts than in human milk.

This disparity in casein content results in a similar contrast in the consistency of the curds formed from the milk of the two species. Cow's milk when acted on by the acid and enzymes of the gastric juice usually forms a hard, tough curd; human milk under the same circumstances yields a soft, semifluid coagulum.

The ash constituents that differ most in relative amounts in the milks of the two species are calcium and phosphorus, which are present in cow's milk in relatively greater proportions, and potassium and iron, which make up a smaller fraction of the ash of cow's milk.

The chemical composition of the fat of cow's milk differs from that of human milk in having a larger proportion of the more difficultly digestible tripalmitin and tristearin and less of the readily digestible triolein. There is also a larger proportion of the glycerides of the volatile fatty acids.

The fat globules of fresh cow's milk are of greater size than those of human milk. They can be reduced in size by homogenization, which is discussed in section VIII, "Milk and Milk Products Other Than Butter." Fat in the emulsified form, as in milk, is partly digested by gastric lipase. There seems to be no satisfactory evidence that the size of the particles of emulsified milk fat affects the rate or completeness of digestion.

The adaptation of cow's milk to the human infant involves consideration of at least the major differences between the two kinds of milk. This point of view was first taken by Biedert,[1] whose monograph published in 1869 initiated the trend toward the scientific adaptation of cow's milk. He studied the chemical and physiologic differences between human and cow's milk in order to have a rational basis for artificial feeding. He showed that the latter contains considerably more protein than human milk and emphasized the difference in curd, attributing the hard consistency of cow's milk curd to the higher content of protein. Biedert [1] did not distinguish between casein and lactalbumin, but he referred to milk protein as "casein," stating that the "caseins" of human and cow's milk differ in quality. He estimated the protein content of human milk at 2 per cent and recommended that the protein content of cow's milk be reduced to a level considerably below that (to 1 or 1.5 per cent), the difference in calories being made up by addition of fat. He used dilutions of cream or combinations of whey and cream. In addition to these mixtures for regular use, Biedert [1] developed a "cream conserve," a thick paste made of casein, butter, milk, cane sugar and milk salts, which could be kept for a considerable period and required only dilution with water before being used. This conserve, which Biedert recommended for use when fresh milk was not available, was a forerunner of modern, "one formula" preparations.

During the eighties Meigs,[1] of Philadelphia, attained unprecedented success in the artificial feeding of infants and exerted wide influence in this country. According to him, human milk never contains more than 1 per cent of protein, and dilutions of cow's milk fed to infants should have a similar concentration of protein. He tried to imitate the relative proportions of the various constituents and the alkaline reaction of human milk. The preparation recommended by Meigs [1] as the regular food for infants to the age of 8 or 9 months consisted of diluted weak cream, solution of calcium hydroxide U. S. P. and sugar. This mixture contained about 1 per cent protein, 4 per cent fat and 7 per cent sugar and according to its originator was an exact imitation of human milk. Meigs had success with it in private practice but was disappointed by the results in hospitals.

Rotch,[1] of Boston, became interested in infant feeding at about 1887. Since he obtained the best results with condensed

1. Cited by Brennemann, Joseph: Practice of Pediatrics, Hagerstown, Md., W. F. Prior Company, Inc., 1936, vol. 1, chap. 26.

milk mixtures, which he found contained about 1 per cent protein, he argued that that proportion was probably the best. He gave Meigs's mixture a trial but soon began to see its limitations. Rotch's efforts to modify this mixture led to the percentage method of infant feeding, with its emphasis on individual constituents of the food rather than on the mixture as a whole.

In Germany an effort to produce a preparation resembling human milk was made by Friedenthal,[1] who reduced the amount of whey, added potassium and made other changes. This mixture was subsequently modified by Schloss [1] and in this country by Gerstenberger and Ruh.[1] The last-named workers attempted not only to imitate human milk but even to improve on it in some respects by fortifying their preparation with vitamins.

One Formula Preparations

There are at present on the market a number of preparations consisting of cow's milk so modified that mere dilution with water yields a mixture for infant feeding. They are known in the trade as one formula preparations. One group of these products represents an effort to imitate with some exactness the composition of human milk; the other group is based on formulas differing somewhat from human milk but found by experience to be adequate and successful. The products of the first group are designed to have approximately the chemical composition, expressed in percentage of foodstuffs, of human milk. In some such products butterfat is replaced by a mixture of fats having the same physical constants as the fat of human milk. There is evidence that infants, particularly those born prematurely, are better able to tolerate the fat of olive oil than the fat of cow's milk. Skimmed milk preparations with added olive oil have been successfully used by many pediatricians. That the nutritional value of these mixtures is likewise similar to that of human milk does not necessarily follow.

There has long been a question whether the proteins of cow's milk are nutritionally equivalent to the proteins of human milk. It has been held that casein, which makes up almost four fifths of the total protein of cow's milk, is nutritionally inferior to lactalbumin, which accounts for about three fifths of the proteins of human milk. This view was based on the lower cystine content (0.3 per cent) of casein as compared with the amount (3.2 per cent) in lactalbumin. More recent work, in particular that of Rose and his collaborators,[2] has shown that cystine is not an essential amino acid but that methionine, the other sulfur-containing amino acid of protein,

2. Womach, M.; Kemmerer, K. S., and Rose, W. C.: The Relation of Cystine and Methionine to Growth, J. Biol. Chem. 121: 403 (Nov.) 1937.

is essential. The methionine content of casein is 3 per cent and of lactalbumin 2.4 per cent. According to comparative content of methionine as well as of other essential amino acids, casein is not inferior to lactalbumin.

The important point, however, is not the minimum amount of protein but the optimal amount which these fixed formula preparations should contain. Evidence is accumulating that the protein content of one formula preparations should be liberal. If the preparation provides 1.5 to 3.5 Gm. of protein for each kilogram of body weight per day, the protein intake is satisfactory regardless of the relative amounts of casein and lactalbumin in the mixture.

As regards the fat of modified milk products, an effort has been made in a few cases to imitate human milk fat in quality as well as quantity. It has been shown, however, that the physical constants employed as criteria for the imitation of human milk fat are not reliable indexes of absorbability. In order to adjust the iodine number of the fat mixture to that of human milk fat in the case of some products, a larger percentage of the less readily absorbed saturated fatty acids has been included. The low iodine value of these acids is offset by the presence of a small amount of the highly unsaturated fatty acids in cod liver oil. The resulting fat mixture matches the fat of human milk in physical constants but is less readily available to the organism. On the other hand, olive oil, which has been substituted for milk fat in some products, has been shown by experiment [3] to be more readily absorbed by infants than the fat of cow's milk; it therefore provides a valuable replacement.

It is obvious that there is no advantage to the baby in modifying cow's milk in an attempt to imitate human milk in physical constants of fat. As previously stated, many products listed here do not attempt such quantitative imitation of human milk but are based on successful formulas. Clinical experience indicates that better results are obtained by such mixtures than by those based on the composition of human milk.

Both types of one formula preparations have the advantages of keeping well, requiring only dilution for use and forming soft curds. These products reduce the possibility of gross errors in infant feeding and offer opportunity for success under adverse conditions.

One formula preparations generally contain vitamin A and vitamin D. The Council has accepted preparations with a vitamin D content ranging from 135 to slightly more than 400 U.S.P. units to the reconstituted quart. In the advertising of one formula preparations containing vitamin D only those

---

3. Holt, L. E.; Tidwell, H. C.; Kirk, C. M.; Cross, D. M., and Neale, S.: Studies in Fat Metabolism: I. Fat Absorption in Normal Infants, J. Pediat. 6:427 (April) 1935. Frontali, G.: Oils as Substitutes for Butter Fat in Infant Feeding, J. Pediat. 14:290 (March) 1939.

allowable claims specified for vitamin D milk, Section VIII "Milk and Milk Products Other than Butter," page 230, may be used.

The listed products of the following firms stand accepted:

Alpha Milk Laboratories, Sacramento, Calif.

ALPHA-LAC, a spray-dried homogenized pasteurized mixture of skimmed milk, lactose, dextrose, coconut oil, cacao butter and cod liver oil.

Analysis (submitted by manufacturer).—Moisture 1.1%, total solids 98.9%, ash 2.5%, fat 28.4%, protein (N × 6.38) 11.3%, crude fiber none, carbohydrates (by difference) 56.7%, titratable acidity as lactic acid 1.1%.

Calories.—5.3 per gram; 151 per ounce.

Vitamins.—By calculation from data supplied in 1934, Alpha-Lac contains 14 U. S. P. units of vitamin A and 7 A. D. M. A. (2 U. S. P.) units of vitamin D per gram; 398 and 57 U. S. P. units of vitamins A and D per ounce; when diluted in the usual proportions, 50 and 7 U. S. P. units of D per fluidounce; not less than 1,500 and 135 units per quart.

The Baker Laboratories, Cleveland.

MEICOSE, a canned homogenized mixture of evaporated skimmed milk, corn syrup, coconut oil, cod liver oil U. S. P. and Ferric ammonium citrate U. S. P.

Analysis.—Undiluted mixture: Moisture 72.0%; total solids 28.0%; ash 1.0%; fat (Mojonnier)[4] 7.0%; protein (N × 6.38) 5.0%; carbohydrates (by difference) 15.0%, iron (Fe) 0.003%. Diluted (14½ oz. diluted to 1 quart [32 oz.]): Moisture 87.3%; total solids 12.7%; ash 0.5%; fat (Mojonnier)[4] 3.0%; protein (N × 6.38) 2.2%; carbohydrates (by difference) 7.0%; iron (Fe) 0.001%.

Calories.—1.5 per gram; 47 per undiluted fluid ounce; 19 per diluted fluid ounce.

Vitamins.—Protocols of biologic assay submitted by the manufacturer (1939) show that the product contains 0.967 U. S. P. units of vitamin D per gram, not less than 400 U. S. P. units per reconstituted quart.

BAKER'S BRAND MODIFIED MILK, POWDERED, a spray-dried homogenized mixture of evaporated skimmed milk, whole milk, lactose, coconut oil, beef fat, dextrose, cod liver oil and gelatin with added wheat germ extract and iron and ammonium citrates U. S. P.

Analysis (submitted by manufacturer).—Moisture 1.4%, total solids 98.6%, ash 2.9%, fat 24.8%, protein (N × 6.38) 15.0%, carbohyrates (by difference) 55.9%.

Calories.—5.06 per gram; 144 per ounce.

Vitamins.—According to biologic assay received in 1938 the product contains 3.9 U. S. P. units of vitamin D per gram; 400 units per quart of the usual dilution.

BAKER'S BRAND MODIFIED MILK, LIQUID, a homogenized mixture of evaporated skimmed milk, whole milk, lactose, coconut oil, beef fat, dextrose cod liver oil and gelatin with added wheat germ extract and iron and ammonium citrates U. S. P.

Analysis (submitted by manufacturer).—Moisture 75.0%, total solids 25.0%, ash 0.8%, fat 6.4%, protein (N × 6.38) 3.8%, carbohydrates (by difference) 14.0%.

Calories.—1.28 per gram; 36 per ounce.

Vitamins.—According to biologic assay received in 1938 the product contains 0.41 U. S. P. units of vitamin D per gram 111 per ounce; 400 units per quart of the usual dilution.

4. Mojonnier, T., and Troy, H. C.: Technical Control of Dairy Products, ed. 2, Chicago, Mojonnier Bros. Press, 1925.

Mead Johnson & Company, Evansville, Ind.

MEAD'S BRAND POWDERED WHOLE MILK WITH DEXTRI-MALTOSE, a spray-dried pasteurized mixture of whole milk and Dextri-Maltose (essentially maltose and dextrins).

Analysis (submitted by manufacturer).—Moisture 2%, total solids 98%, ash 5%, fat 19%, protein (N × 6.38) 18%, lactose[5] (copper reduction method) 26%, reducing sugar as maltose[5] 16%, dextrins (by difference)[5] 14%.

Calories.—4.7 per gram; 133 per ounce.

OLAC, a spray-dried homogenized pasteurized mixture of skimmed milk, Dextri-Maltose (essentially maltose and dextrins), olive oil, calcium caseinate and halibut liver oil.

Analysis (submitted by manufacturer).—Moisture 1.5%, total solids 98.5%, ash 3.5%, fat 18.5%, protein (N × 6.38) 23.4%, crude fiber none, carbohydrates (by difference) 53.1%.

Calories.—4.7 per gram; 134 per ounce.

Vitamins.—According to the reported (1937) value of the halibut liver oil, Olac contains 49.5 U. S. P. units of vitamin A and 0.84 U. S. P. units of vitamin D per gram; 1,400 and 24 units per ounce when diluted in the usual proportions; 6,440 and 110 units per quart.

Reports of clinical experiments[6] have shown that Olac is a useful preparation in the feeding of infants born prematurely.

MEAD'S BRAND DEXTRI-MALTOSE WITH EXTRACTS OF WHEAT EMBRYO AND YEAST. (For description ot this product, *See* page 176.)

RECOLAC, a drum-dried homogenized mixture of skimmed milk, of which the casein has been modified by conversion to potassium caseinate, oleo, coconut and cod liver oil and Dextri-Maltose.

Analysis (submitted by manufacturer).—Moisture 1.4%, total solids 98.6%, ash 3.3 %, protein (N × 6.25) 16 0%, fat 27.0%, lactose (copper reduction method)[5] 18.7%, reducing sugars as maltose[5] 17.4%, dextrins (by difference)[5] 16.2%, Reichert-Meissl number of fat 2.8, calcium (Ca) 0.25%, sodium (Na) 0.30%, potassium (K) 1.03%, phosphorus (P) 0.41%, chlorine (Cl) 0.45%, magnesium (Mg) 40 mg. per hundred grams iron (Fe) 2.0 mg. per hundred grams, copper (Cu) 0.46 mg. per hundred grams, sulfur (S) 40 mg. per hundred grams.

Calories.—5.2 per gram; 148 per ounce.

Vitamins.—According to the calculation of the company (1937), the cod liver oil ingredient supplies approximately 14.4 U. S. P. units of vitamin A and 1.4 U. S. P. units of vitamin D per gram of Recolac; 410 and 40 units per ounce; when diluted in the usual proportions, not less than 1,600 and 135 units per quart. The added vitamin B_1 is intended to replace that lost in the whey in the course of preparation.

M & R Dietetic Laboratories, Inc., Columbus, Ohio.

SIMILAC, a spray-dried homogenized mixture of fresh skimmed milk of which the calcium caseinate has been converted to sodium and potassium caseinate, additional lactose, potassium, milk fat and olive oil, coconut oil and cod liver oil. The casein coagulates in a soft fine flocculent curd. U. S. patents 1,450,836 (April 3, 1923); 1,563,891 (Dec. 1, 1925).

Analysis (submitted by manufacturer).—Moisture 3.0%, total solids 97.0%, ash 3.2%, fat 27.1%, protein (N × 6.38) 12.3%, lactose (by difference) 54.4%.

Calories.—5.12 per gram; 145 per ounce.

Vitamins.—No claim is made for vitamin D, the cod liver oil being added to restore the vitamin content to what good whole milk would provide.

---

5. Calculated from analyses of component ingredients.

6. Stoesser, A. V.: A Clinical Evaluation of a New Feeding for Premature Infants, Journal-Lancet 57: 410-414, (Sept.) 1937. Blatt, M. L., and Harris, E. H.: The Substitution of Olive Oil for Butter Fat in Infant Feeding, J. Pediat. 11: 455 (Oct.) 1937.

Nestle's Milk Products, Inc., New York.

LACTOGEN, a spray-dried homogenized mixture of whole milk, added milk fat and lactose. The usual dilution approximates human milk in the percentage of fat, protein, carbohydrate and total mineral salts.

Analysis (submitted by manufacturer).—Moisture 2.0%, total solids 98.0%, ash 3.5%, fat 25.0%, protein (N × 6.38) 16.2%, lactose (by difference) 53.3%.

Calories.—5.02 per gram; 142.6 per ounce.

NESTLE'S FOOD, a drum-dried homogenized mixture of malted whole wheat, malt, sweetened condensed milk, wheat flour, salt, dicalcium phosphate ($CaHPO_4$) and tricalcium phosphate ($Ca_3[PO_4]_2$), iron citrate and cod liver oil concentrate. About 33 per cent of the resulting product is whole milk solids.

Analysis (submitted by manufacturer).—Moisture 2.0%, total solids 98.0%, ash 2.8%, fat 9.8%, protein (N × 6.25) 15.0%, sucrose 22.0%, lactose 13.0%, dextrins and maltose 21.5%, starch 13.0%, crude fiber 0.9%, total carbohydrates other than cereal fiber (by difference) 69.5%, iron (Fe) 3.5 mg. per hundred grams, calcium (Ca) 0.45%, phosphorus (P) 0.35%.

Calories.—4.3 per gram; 122 per ounce.

Vitamins.—The firm reported (1937) that sufficient cod liver oil concentrate is used to supply approximately 14 U. S. P. units of vitamin A and 1.4 U. S. P. units of vitamin D per gram of Nestle's Food; 400 and 40 units per ounce; when diluted in the usual proportions, not less than 2,100 and 135 units per quart.

S. M. A. Corporation, Cleveland.

S. M. A. POWDER, a spray-dried homogenized mixture of skimmed milk, lactose, beef fat, cocoa butter, coconut and cod liver oil and potassium chloride. When prepared according to directions it approximates human milk in percentages of fat, protein, lactose and ash; the chemical constants of the fat are similar to those of human milk fat; the pH, buffer value, specific gravity and caloric value are also similar to those of human milk. U. S. patents 1,445,434 (Feb. 13, 1923); 1,609,617 (Dec. 7, 1926).

Analysis (submitted by manufacturer).—Moisture 1%, total solids 99%, ash 2%, fat 28%, protein (N × 6.38) 10%, lactose (by difference) 59%. Approximate chemical constants of S. M. A. fat: saponification number 206, iodine number 50, Polenske number 2, Reichert-Meissl number 2, melting point 37 C.

Calories.—5.3 per gram; 151 per ounce.

Vitamins.—In 1938 protocols of biologic assay showed that S. M. A. powder contains 66 U. S. P. units of vitamin A and 4.6 U. S. P. units of vitamin D per gram; 1,875 and 130 per ounce. Protocols of biologic assay (1939) showed that S. M. A. powder contains 1.8 international units of vitamin B_1 per gram. The product as usually diluted contains not less than 7,500 units of vitamin A, 200 of vitamin B_1, and 400 of vitamin D per quart.

Reports of clinical experiments have shown that S.M.A. is useful in the feeding of infants.[7]

S. M. A. CONCENTRATED LIQUID, a homogenized sterilized mixture of skimmed milk, lactose, beef fat, cocoa butter, coconut and cod liver oil and potassium chloride. *See* description of S. M. A. Powder.

Analysis (submitted by manufacturer).—Moisture 72.9%, total solids 27.1%, ash 0.7%, fat 7.5%, protein (N × 6.38) 3.1%, lactose (by difference 15.8%.

---

7. Gerstenberger, H. J.; Haskins, H. D.; McGregor, H. H., and Ruh, H. O.: Studies in the Adaptation of an Artificial Food to Human Milk, Am. J. Dis. Child. **10**: 249 (Oct.) 1915. Gerstenberger, H. J., and Ruh, H. O.: Studies in the Adaptation of an Artificial Food to Human Milk. II. A Report of Three Years Clinical Experience with the Feeding of S. M. S. (Synthetic Milk Adapted), **17**: 1 (Jan.) 1919.

Calories.—1.4 per gram; 41 per fluidounce.

Vitamins.—Protocols of biologic assay (1938) showed that S. M. A. Liquid contains 17 U. S. P. units of vitamin A and 1.2 U. S. P. units of vitamin D per cubic centimeter. Protocols of biologic assay (1939) showed that S. M. A. Liquid contains 0.5 international units of vitamin B_1 per cubic centimeter. As usually diluted the product contains not less than 7,500 units of vitamin A, 200 of vitamin B_1, and 400 of vitamin D per quart.

Acid Milk Preparations

While buttermilk was long employed empirically as an infant food, the use of acid milk has been given a rational basis only in the last twenty years. Cow's milk has been shown to be richer in buffer substances than human milk; that is, it has a greater capacity for absorbing added acid and at the same time resisting change in p_H. Therefore, a greater amount of acid must be added to cow's milk than to human milk to bring the hydrogen ion concentration into the range favorable to gastric digestion. Marriott[8] suggested the addition of acid to the feeding formula in order to supplement the acid of the gastric juice and to reduce the time required to develop the degree of acidity necessary for digestion in the stomach.

Acid milk may be prepared by culturing milk with lactic acid-producing organisms or by adding acid. While a variety of acids may be used, lactic acid is most commonly employed for this purpose. Like sweet milk, acid milk requires the addition of carbohydrate to make it a suitable infant food. It is usually tolerated in higher concentrations than sweet milk.

In common with many other preparations for infant feeding, acid milk yields soft curds in the stomach. Its acidity constitutes an added advantage, rendering it especially suitable for the treatment of marasmus and digestive disorders.

The process of spray drying, to which the listed products of this class are subjected, diminishes the content of vitamin C but does not affect the other vitamins present in milk.

The listed products of the following firms stand accepted:

The Borden Company, New York, products distributed by Merrell-Soule Company, Inc., New York.

MERRELL-SOULE BRAND POWDERED CULTURED SKIMMED LACTIC ACID MILK (AKRELAC), spray-dried pasteurized skimmed milk inoculated with a pure culture of lactic acid organism (Streptococcus lactis).

Analysis (submitted by manufacturer).—Moisture 3.0%, total solids 97.0%, ash 8.0%, fat 1.0%, protein (N × 6.38) 36.0%, lactose 47.8%, carbohydrates (by difference) 52.0%, free lactic acid 4.2%, total titratable acidity as lactic acid 5.0%.

Calories.—3.61 per gram; 103 per ounce.

MERRELL-SOULE BRAND WHOLE LACTIC ACID MILK POWDER, spray-dried pasteurized whole milk inoculated with a pure culture of lactic acid organism (Str. lactis).

Analysis (submitted by manufacturer).—Moisture 2.3%, total solids 97.7%, ash 6.0%, fat 28.0%, protein (N × 6.38) 26.5%, lactose, 32.5%, carbohydrates (by difference) 37.2%, free lactic acid 4.25%, total acidity 5.0%.

Calories.—5.07 per gram; 144 per ounce.

---

8. Marriott, W. McKim: Infant Nutrition, ed. 2, St. Louis, C. V. Mosby Company, 1935, p. 188.

Mead Johnson & Company, Evansville, Ind.

MEAD'S BRAND POWDERED LACTIC ACID MILK (WHOLE MILK CULTURED), spray-dried homogenized partially evaporated pasteurized whole milk inoculated with a pure culture of Streptococcus lactis.

Analysis (submitted by manufacturer).—Moisture 1.5%, total solids 98.5%, ash 6.0%, fat 28.0%, protein (N × 6.38) 26.8%, carbohyrates (by difference) 37.7%, titratable acidity as lactic acid 2.5%, calcium (Ca) 0.95%, phosphorus (P) 0.67%, magnesium (Mg) 80 mg. per hundred grams, sodium (Na) 0.50%, potassium (K) 1.20%, sulfur (S) 40 mg. per hundred grams, chlorine (Cl) 0.78%, iron (Fe) 2 mg. per hundred grams, copper (Cu) 0.5 mg. per hundred grams.

Calories.—5.10 per gram; 145 per ounce.

MEAD'S BRAND POWDERED LACTIC ACID MILK (HALF SKIMMED) ACIDULATED WITH U. S P. LACTIC ACID, a spray-dried homogenized pasteurized mixture of partially defatted milk (1.5 per cent fat) and lactic acid U. S. P. An acidity of 0.45 per cent is produced.

Analysis (submitted by manufacturer).—Moisture 1.5%, total solids 98.5%, ash 6.8%, fat 11.6%, protein (N × 6.38) 31.9%, carbohydrates (by difference) 48.2%, titratable acidity as lactic acid 3.4%, calcium (Ca) 1.1%, phosphorus (P) 0.87%, magnesium (Mg) 0.11%, sodium (Na) 0.56%, potassium (K) 1.50%, sulfur (S) 90 mg. per hundred grams, chlorine (Cl) 0.89%, iron (Fe) 2 mg. per hundred grams, copper (Cu) 0.5 mg. per hundred grams.

Calories.—4.25 per gram; 121 per ounce.

MEAD'S BRAND POWDERED LACTIC ACID MILK—NON-CURDLING NO. 1 WITH DEXTRI-MALTOSE, a mixture of whole milk (3.5 per cent fat), lactic acid U. S. P. (to produce an acidity of 0.4 per cent as lactic acid) and Dextri-Maltose (essentially maltose and dextrins) 5 per cent, heat processed to prevent curdling and then homogenized and spray dried.

Analysis (submitted by manufacturer).—Moisture 1.5%, total solids 98.5%, ash 4.3%, fat 19.1%, protein (N × 6.38) 18.3%, maltose 16.2%, dextrins 13.4%, lactose 25.5%, carbohydrates (by difference) 56.8%, acidity as lactic acid 1.75%, calcium (Ca) 0.632%, magnesium (Mg) 62 mg. per hundred grams, sodium (Na) 0.374%, potassium (K) 0.921%, phosphorus (P) 0.495%, chlorine (Cl) 0.620%, sulfur (S) 68 mg. per hundred grams, iron (Fe) 4.0 mg. per hundred grams, copper (Cu) 2.1 mg. per hundred grams.

Calories.—4.72 per gram; 134 per ounce.

MEAD'S BRAND POWDERED LACTIC ACID MILK—NON-CURDLING NO. 2 PLAIN, a mixture of whole milk (3.5 per cent fat) and lactic acid U. S. P. (to produce an acidity of 0.4 per cent as lactic acid), heat processed to prevent curdling and then homogenized and spray dried.

Analysis (submitted by manufacturer).—Moisture 1.5%, total solids 98.5%, ash 6.0%, fat 27.2%, protein (N × 6.38) 26.0%, lactose 36.3%, carbohydrates (by difference) 39.3%, acidity as lactic acid 3.0%, calcium (Ca) 0.845%, magnesium (Mg.) 72 mg. per hundred grams, sodium (Na) 0.481%, potassium (K) 1.220%, phosphorus (P) 0.705%, chlorine (Cl) 0.767%, sulfur (S) 56 mg. per hundred grams, iron (Fe) 1.4 mg. per hundred grams, copper (Cu) 0.5 mg. per hundred grams.

Calories.—4.94 per gram; 141 per ounce.

Merrell-Soule Company, Inc., New York. *See* The Borden Company, New York.

Protein Milk Preparations

Protein milk was introduced by Finkelstein and Meyer [1] in 1906 for the feeding of infants with diarrhea. It consists of acid milk with added milk curd, and it therefore contains more protein and less carbohydrate, fat and ash than whole milk.

Because of the acidity, the softness of the curd and the low carbohydrate content, protein milk is particularly well tolerated in digestive disorders.

Protein milk may be prepared at home by adding the drained and sieved curd of rennin-coagulated whole milk to lactic acid skimmed milk or to buttermilk and sieving and diluting the mixture. Since the preparation of this product at home is time consuming and exacting, the convenience of commercial dried preparations is a great advantage.

The listed products of the following firms stand accepted:

The Borden Company, New York, product distributed by Merrell-Soule Company, Inc., New York.

MERRELL-SOULE BRAND POWDERED PROTEIN MILK, spray-dried homogenized pasteurized whole milk of which 53 per cent has been removed as whey after inoculation with Streptococcus lactis.

Analysis (submitted by manufacturer).—Moisture 3.0%, total solids 97.0%, ash 5.0%, fat 27 0%, protein (N × 6.38) 37.0%, lactose 23.0%, lactic acid 5.0%.

Calories.—4.83 per gram; 137 per ounce.

Mead Johnson & Company, Evansville, Ind.

MEAD'S BRAND POWDERED PROTEIN MILK NON-CURDLING, a spray-dried homogenized mixture of two parts of the whey of whole milk treated with calcium chloride and one part of skimmed milk acidified with lactic acid U. S. P. The product is heated to prevent curdling.

Analysis (submitted by manufacturer).—Moisture 1.5%, total solids 98.5%, ash 6.0%, fat 26.5%, protein (N × 6.38) 39.0%, carbohydrates (by difference) 27.0%, titratable acidity as lactic acid 3.0%.

Calories.—5.0 per gram; 142 per ounce.

Merrell-Soule Company, Inc., New York. *See* The Borden Company, New York.

S. M. A. Corporation, Cleveland.

PROTEIN S. M. A. (ACIDULATED), a spray-dried homogenized mixture of pasteurized skimmed milk and soluble sodium caseinate, S. M. A. fat mixture (beef fat, cacao butter and coconut and cod liver oils), a pure culture of Streptococcus lactis and fresh lemon juice (to obtain a p_H of 4.6). U. S. patents 1,445,434 (Feb. 13, 1923); 1,609,617 (Dec. 7, 1926).

Analysis (submitted by manufacturer).—Moisture 2.0%, total solids 98.0%, ash 6.0%, fat 22%, protein (N × 6.38) 35%, lactose (by difference) 28%, lactic acid 1%, citric acid 6%; chemical constants of the fat: melting point 37 C., saponification number 206, iodine number 46, Polenske number 2, Reichert-Meissl number 1.2.

Calories.—4.78 per gram; 136 per ounce.

Vitamins.—Protocols of biologic assays (1938) showed the potency of the powder to be 99 U. S. P. units of vitamin A and 8.13 U. S. P. units of vitamin D per gram; 2,812 and 227 units per ounce. The product as usually diluted contains 281.2 and 23.1 U. S. P. units of vitamins A and D per fluidounce, 9,000 and 740 units per quart. This amount of vitamin D usually prevents rickets. The firm claims only 7,500 U. S. P. units of vitamin A and 400 U. S. P. units of vitamin D per reconstituted quart. A fluidounce of usual dilution also contains some vitamin C, equivalent to about 0.6 cc. of fresh lemon juice. An additional source of vitamin C should be given.

Other Milk Preparations

The milk products included in this group are preparations that have been fortified with additional vitamin B_1 and vitamin D, or which are intended for the modifications of formulas

used in infant feeding. Milk fortified with only vitamin D is described in section VIII, "Milk and Milk Products Other than Butter."

The listed products of the following firms stand accepted:

The Borden Company, New York.

SPECIAL DRYCO, a drum-dried partially defatted milk (Dryco) fortified with vitamin B_1 concentrate prepared from rice polishings and irradiated with ultraviolet rays under license by the Wisconsin Alumni Research Foundation under the Steenbock process (U. S. patent 1,680,818, Aug. 14, 1928) and the Supplee process (U. S. patent 1,817,936, Aug. 11, 1931).

Analysis (submitted by manufacturer).—Moisture 3.1%, total solids 96.9%, ash 7.0%, fat 11.6%, protein (N × 6.25) 31.5%, carbohydrates (by difference) 46.8%, iron (Fe) 3.5 mg. per hundred grams, copper (Cu) 0.5 to 0.7 mg. per hundred grams.

Calories.—4.2 per gram; 119 per ounce.

Vitamins.—According to biologic assay reported in 1934 the powder contains 5 Sherman-Chase (2.5 international) units of vitamin B_1 and 1.3 to 1 8 U. S. P. X (U. S. P.) units of vitamin D per gram; 71 international and 37 to 52 U. S. P. units of vitamins B_1 and D per ounce; and when diluted in the usual proportions not less than 273 international and 135 U. S. P. units per quart.

Mead Johnson & Company, Evansville, Ind.

CASEC (Calcium Cassinate), containing dried skimmed milk.

Analysis (submitted by manufacturer).—Moisture 5.5%, total solids 94.5%, ash 4.5%, fat 2.0%, protein (N × 6.38) 88.0%, crude fiber none, carbohydrates (by difference) none, calcium (Ca) 1.8%, phosphorus (P) 0.6%.

Calories.—3.7 per gram; 105 per ounce.

Nestle's Milk Products, Inc., New York.

HYLAC, a spray-dried mixture of malted whole wheat extract (essentially dextrine and maltose), homogenized whole milk, added milk fat and lactose U. S. P., and a small amount of iron citrate.

Analysis (submitted by manufacturer).—Moisture 2.0%, total solids 98.0%, ash 2.0%, fat 21.5%, protein (N × 6.25) 5.5%, lactose[9] 17.0%, reducing sugars as maltose[9] 24.0%, dextrine[9] (by difference) 28.0×, carbohydrates (by difference) 69.0%, iron (Fe) 3.6% mg. per sundred grams.

Calories.—4.9 per gram; 139 per ounce.

Vitamins.—Protocols submitted by manufacturer (1938) show that Hylac contains 0.66 international units of vitamin B_1 per gram; 187 per ounce; 300 per pound.

Protein Mineral Company, Inc., New York.

LACTICAM, dried milk whey with added milk salts.

Analysis (submitted by manufacturer).—Moisture 5.0%, total solids 95.0%, ash 12.5%, fat 1.5%, protein (N × 6.38) 13.0%, lactose (Bertrand method) 65.0%, carbohydrates (by difference) 70.6%, calcium (Ca) 2.20%, chlorine (Cl) 2.10%, iron (Fe) 11 mg. per hundred grams, magnesium (Mg) 0.21%, phosphorus (P) 1.30%, potassium (K) 2.11%, sodium (Na) 0.68%.

Calories.—3.5 per gram; 99 per ounce.

HYPOALLERGENIC PREPARATIONS

Allergic reactions in infants can be distressing when the ordinary foods employed for infant feeding, especially cow's milk, are not tolerated. In such cases there are a number of preparations that may be used successfully. Some of these

9. Estimated from analysis of formula components.

consist of milk that has been subjected to prolonged heat to modify the anaphylactic quality of the proteins. Others are made up of foods other than milk, and some avoid also other common allergens, such as cereal and egg.

The listed products of the following firms stand accepted:

Mead Johnson & Company, Evansville, Ind.

CEMAC, a sieved homogenized cooked mixture of cauliflower, tomatoes, beef, carrots, water, spinach, Dextri-Maltose (essentially maltose and dextrins), olive oil, gelatin, dicalcium phosphate ($CaHPO_4$) and disodium phosphate (Na_2HPO_4), processed in hermetically sealed tins under steam pressure. A one formula preparation free from cereal, egg and milk for infants and children allergic to the proteins of these foods.

Analysis (submitted by manufacturer).—Moisture 74.8%, total solids 25.2%, ash 1.4%, fat 6.4%, protein (N $\times$ 6.25) 6.2%, crude fiber 0.3%, carbohydrates other than crude fiber (by difference) 10.9%, calcium (Ca) 0.22%, phosphorus (P) 0.30%, magnesium (Mg) 20 mg. per hundred grams, sodium (Na) 0.30%, potassium (K) 0.28%, chlorine (Cl) 40 mg. per hundred grams, sulfur (S) 60 mg. per hundred grams, iron (Fe) 8 mg. per hundred grams, copper (Cu) 1.5 mg. per hundred grams, *p*H 5.0.

Calories.—1.3 per gram; 37 per ounce.

MEAD'S SOBEE, a drum-dried homogenized mixture of soy bean flour, olive oil, arrowroot starch, Dextri-Maltose (essentially maltose and dextrins), dicalcium phosphate ($CaHPO_4$) and sodium chloride. The dry ingredients are cooked under low steam pressure with a small amount of water. A milk substitute free from animal and milk proteins, to be used as the basis of a feeding formula.

Analysis (submitted by manufacturer).—Moisture 2.4%, total solids 97.6%, ash 8.0%, sodium chloride (NaCl) 1.0%, fat 19.2%, protein (N $\times$ 6.25) 32.0%, crude fiber 1.4%, carbohydrates other than crude fiber (by difference) 37.0%, calcium (Ca) 1.45%, chlorine (Cl) 0.66%, copper (Cu) 8 mg. per hundred grams, iron (Fe) 20 mg. per hundred grams, magnesium (Mg) 0.16%, phosphorus (P) 1.40%, potassium (K) 1.42%, sodium (Na) 0.43%, sulfur (S) 0.30%, arsenic (As) less than 0.05 mg. per hundred grams, lead (Pb) less than 0.19 mg. per hundred grams.

Calories.—4.5 per gram; 128 per ounce.

Vitamins.—Biologic assay (1935) showed approximately 2 Chick and Roscoe (international) units of vitamin B_1 per gram; 57 units per ounce.

The Muller Laboratories, Baltimore.

MULL-SOY, a canned homogenized cooked mixture of soy bean flour, soy bean oil, dextrose, sucrose, tricalcium phosphate ($Ca_3[PO_4]_2$), sodium chloride, and calcium carbonate. A food preparation to be substituted for milk in feeding infants, older children or adults who are sensitive to the proteins of cow's milk.

Analysis (submitted by manufacturer).—Moisture 75.0%, total solids 25.0%, ash 2.0%, fat (ether extract) 7.8%, protein (N $\times$ 6.25) 6.0%, crude fiber 0.3%, sucrose 1.5%, dextrose 3.3%, carbohyrates other than crude fiber (by difference) 8.9%, calcium (Ca) 0.26%, phosphorus (P) 0.22%, sodium (Na) 0.16%.

Calories.—1.3 per gram; 37 per avoirdupois ounce; 40 per fluidounce.

Vitamins.—According to report of assays performed in 1936 and 1937, Mull-Soy contains 0.2 international unit of vitamin B_1 per gram; 100 international units of vitamin B_1 per quart when diluted with an equal volume of water.

S. M. A. Corporation, Cleveland.

ALBERDEX-PROTEIN-FREE MALTOSE AND DEXTRINS, a nonhygroscopic spray-dried filtered extract, essentially maltose and dextrins, prepared by the proteolytic and diastatic action of malt on noncereal starch. Proteins

precipitable by the ordinary protein reagents are absent. It is suitable as a carbohydrate supplement to milk in infant feeding formulas and is especially intended for diets free of cereal protein.

Analysis (submitted by manufacturer).—Moisture 3.0%, total solids 97.0%, ash 0.5%, fat none, hydrolyzed protein (N × 6.25) 0.5%, reducing sugars as maltose 50.0%, dextrins (by difference) 46.0%.

Calories.—3.9 per gram; 111 per ounce.

SMACO BRAND HYPO-ALLERGIC SKIM MILK, canned pasteurized skimmed milk subjected to prolonged heat in the can.

Analysis (submitted by manufacturer).—Moisture 90.9%, total solids 9.1%, ash 0.7%, fat 0.1%, protein (N × 6.38) 3.2%, lactose (by difference) 4.9%.

Calories.—0.35 per cubic centimeter; 0.33 per gram; 10 per fluidounce; 9.4 per ounce.

SMACO BRAND HYPO-ALLERGIC WHOLE MILK (LIQUID), canned homogenized pasteurized whole milk processed under steam pressure for a long period.

Analysis (submitted by manufacturer).—Moisture 87.6%, total solids 12.4%, ash 0.7%, fat 3.5%, protein (N × 6.38) 3.3%, lactose (by difference) 4.7%.

Calories.—0.60 per cubic centimeter; 0.64 per gram; 19.5 per fluidounce; 18.2 per ounce.

SMACO BRAND HYPO-ALLERGIC WHOLE MILK POWDER, spray-dried homogenized pasteurized whole milk which in liquid form is processed under steam pressure for a long period.

Analysis (submitted by manufacturer).—Moisture 2.0%, total solids 98.0%, ash 6.0%, fat 27.0%, protein (N × 6.38) 26%, lactose (by difference) 39%.

Calories.—5 per gram; 142 per ounce.

CARBOHYDRATE PREPARATIONS

The minimal amount of carbohydrate on which an infant can be maintained is of some theoretic interest. It is probably about 3 Gm. per kilogram of body weight per day (0.05 ounce per pound). The optimal amount is said to be from 8 to 14 Gm. per kilogram (0.13 to 0.22 ounce per pound). The infant fed on human milk receives daily about 12 Gm. of carbohydrate per kilogram of body weight. The sole carbohydrate of milk is lactose, which is present in human milk to the extent of 7 per cent and in cow's milk to the extent of about 4 per cent. Because cow's milk is usually diluted for infant feeding, carbohydrate is added to make up the deficiency. Experience has shown, however, that the added carbohydrate need not be lactose. The milk that forms the basis of the usual feeding mixture contains some lactose; this amount appears to be adequate for any specific lactose requirement that may exist.

An important property of carbohydrates that bears on infant feeding is the rate of digestion and absorption. The more slowly absorbed sugars persist in higher concentrations farther down in the intestine and may offer a favorable medium for bacteria. The end products of bacterial action include certain organic acids which may irritate the mucosa and produce diarrhea.

The characteristics of the various carbohydrates used in infant feeding are briefly described under the appropriate headings. It is the opinion of eminent pediatricians, however, that for the routine feeding of normal infants the kind of carbohydrate is of minor importance compared with other feeding problems. The carbohydrates used as milk modifiers are all digestible and of approximately equal caloric value.

Individual Sugars

Dextrose

The monosaccharide dextrose is the form to which all utilizable carbohydrates are converted after absorption in the body; this is therefore the form in which carbohydrate is ultimately utilized It requires no action by enzymes to make it absorbable, and although dextrose is easily fermented, it is so readily absorbed by the intestine that little opportunity is given for fermentation. A high proportion of dextrose in the formula may therefore be tolerated. Since other carbohydrates provide dextrose in the body, this sugar is seldom used in pure form in the feeding of normal infants. In the treatment of celiac disease dextrose has proved of distinct value and it is useful also in diarrhea.

Accepted brands of dextrose are listed in section X, "Sugars, and Syrups."

Lactose (Alpha Lactose)

Lactose is a disaccharide, which is split by digestive enzymes into dextrose and galactose. Lactose is digested and its products are absorbed more slowly than some other sugars. As a result, some lactose may reach the large intestine unabsorbed. Here it is acted on by the intestinal bacteria, with the production of acids. Lactose encourages the growth of the gram-positive organisms that predominate in the intestinal tract of a breast-fed infant. It is said to favor the absorption of calcium from the intestine (although evaluation of the importance of this property is most difficult), probably because the acids liberated by the action of bacteria on lactose hold the calcium in solution. These acids probably account for the laxative effect of lactose. Many infants do not tolerate lactose in as high a proportion as other carbohydrates.

Beta Lactose

Ordinary milk sugar is alpha lactose. If a concentrated solution of this sugar is permitted to crystallize at temperatures above 93 C., the crystals produced are those of beta lactose. This sugar differs from the more common milk sugar in a number of physical properties. The two sugars are stereoisomers, differing only in the spatial configuration of the carbon atom of the aldehyde group. Beta lactose is more readily soluble in water than the alpha form, and it has a sweeter taste. The specific rotation of beta lactose, when the solution is freshly

prepared, is about $+35°$; on standing this value gradually increases. The specific rotation of alpha lactose is about $+81°$; on standing this value gradually decreases. At equilibrium the specific rotation of a mixture of alpha and beta lactose is about $+52°$. Beta lactose has apparently the same physiologic properties as alpha lactose except for its sweeter taste.

SUCROSE

Sucrose (cane sugar, beet sugar) is a disaccharide that yields on hydrolysis dextrose and levulose. The cheapest and most easily obtainable of the sugars, sucrose has been extensively used with success as a carbohydrate for infant feeding. The fact that it is the sweetest of the common sugars has led to fear that its use might accustom infants to so sweet a mixture that they might refuse later food. It is the opinion of many pediatricians that this criticism of sucrose is not borne out in practical experience. The fact that sucrose ferments readily appears to have slight importance in view of the clinical success achieved by its use.

Accepted brands of sucrose are listed in section X, "Sugars, and Syrups."

Mixed Carbohydrate Preparations

Mixed carbohydrate preparations for infant feeding may contain several ingredients not described under the heading "Individual Sugars." These are starch, which makes up the bulk of the carbohydrate of diets for adults, and its degradation products. Starch itself is used to a limited extent in milk formulas. An infant unaccustomed to it may not digest it well and may excrete a considerable portion of it in the stools. But the repeated feeding of starch gradually develops the ability to digest it. Starch does not ferment readily in the intestine. Unlike most sugars, when added to milk it softens the curd and thereby renders the milk more readily digestible.

Starch is a polymer of dextrose, and on hydrolysis yields successively dextrins, maltose and dextrose. The term "dextrin" is applied to a group of poorly defined substances of graded complexity, intermediate between starch and sugar. The more complex dextrins resemble starch in giving a color reaction with iodine. The colors so produced vary from purple, in the case of amylodextrin, to brownish red, given by erythrodextrin. The simpler dextrins, which are classed as achroodextrin, resemble sugars in yielding no color with iodine. Maltose is a disaccharide which on hydrolysis yields two molecules of dextrose.

The agents used in the degradation of starch are acids and enzymes. Treatment by acid is capable of effecting the complete hydrolysis of starch; the action of enzymes is limited to certain steps. Amylase reduces starch to the disaccharide maltose. The enzyme maltase is required for the conversion of maltose to dextrose.

In the intestinal tract the dextrins do not favor fermentation because the fermentable sugars to which they are converted on digestion are readily absorbed and do not accumulate. For this reason dextrins, which are usually fed in combination with maltose, have found favor with pediatricians for the feeding of infants, especially those with digestive disturbances of a fermentative nature. A further advantage of these products is that they provide a combination of carbohydrates. Combinations are acted on by more than one digestive enzyme at a time; in addition, they permit absorption of one sugar while another is undergoing digestion, thereby preventing the presence at any one time of considerable amounts of irritating or fermentable sugar in the intestine. When a large proportion of carbohydrate must be included in the formula, these combinations are especially useful because they are tolerated in amounts in which single sugars could not be taken. Accepted products include malt extracts, products of malt diastase, products of the acid hydrolysis of starch and other carbohydrate preparations designed for infant feeding.

MALT EXTRACT

Malt, or malted barley, is barley that has begun to sprout. During sprouting a diastatic enzyme develops which is used commercially to digest the starch from the barley itself or from other sources. The enzyme is not isolated but may be added as malt to the material to be digested. Malt diastase digests starch only as far as the maltose stage and does not liberate dextrose. The carbohydrates of malted products are therefore chiefly dextrins and maltose.

Malt extract is the concentrated aqueous extract of an infusion of malt. In addition to diastase and partially digested starch, it contains various water-soluble extractives of the barley.

In infant feeding, liquid or powdered malt extract is employed as a laxative rather than as a carbohydrate for regular use. Since the carbohydrates of malt extract are easily tolerated, other ingredients are probably responsible for its characteristic laxative action. Malt extract is an ingredient of Keller's malt soup, which contains also flour and diluted milk. The diastatic activity of malt extract has no significance for digestion of starch in the alimentary tract.

The listed products of the following firms stand accepted:

PLAIN EXTRACTS

Borcherdt Malt Extract Company, Chicago.

BORCHERDT'S BRAND MALT EXTRACT (PLAIN), a concentrated diastatically active barley malt extract (U. S. P.) containing 10 per cent by weight of glycerin.

Analysis (submitted by manufacturer).—Moisture 22.3%, total solids 77.7%, ash 1.1%, protein (N × 6.25) 4.4%, reducing sugars as maltose 52.5%, dextrins (by difference) 9.0%, carbohydrates (by difference) 61.5%, titratable acidity as lactic acid 0.7%, glycerin 10%, calcium (Ca) 20 mg. per hundred grams, iron (Fe) 0.5 mg. per hundred grams, mag-

nesium (Mg) 80 mg. per hundred grams, phosphorus (P) 0.25%, potassium (K) 0.25%, sodium (Na) 90 mg. per hundred grams. Diastatic value: One gram converts from 5 to 7 Gm. of starch (U. S. P. method).

Calories.—3.1 per gram; 88 per ounce.

Vitamins.—Biologic assay reported in 1936 shows 1.5 international units of vitamin B_1 per gram; 42.6 units per ounce.

Malt-Diastase Company, Brooklyn.

M. D. Co. BRAND POWDERED MALT EXTRACT FOR MILK, a spray-dried diastatically active barley malt extract.

Analysis (submitted by manufacturer).—Moisture 2.3%, total solids 97.7%, ash 1.9%, fat 0.1%, protein (N × 6.25) 9.1%, reducing sugars as anhydrous maltose 80.5%, acidity as lactic acid 1.9%, dextrins (by difference) 4.3%, carbohydrates (by difference) 84.7%, iron (Fe) 7 mg. per hundred grams, aluminum (Al) 5 mg. per hundred grams, potassium (K) 0.23%, sulfur (S) 0.13%, calcium (Ca) 40 mg. per hundred grams, phosphorus (P) 0.34%, magnesium (Mg) 0.14%, chlorine (Cl) 70 mg. per hundred grams, sodium (Na) 80 mg. per hundred grams. Diastatic value: One gram converts 10 Gm. of starch (U. S. P. method).

Calories.—3.9 per gram; 111 per ounce.

Vitamins.—According to an assay reported in 1932, this product contains one and one-half times as much vitamin B_1 and twice as much vitamin G (riboflavin) as the fresh moist yeast tested.

EXTRACTS WITH ADDED SALT

Borcherdt Malt Extract Company, Chicago.

BORCHERDT'S BRAND DRI-MALT SOUP EXTRACT WITH ADDED POTASSIUM CARBONATE, a powdered nondiastatic malt extract (Borcherdt's Malt Soup Extract) with added potassium carbonate.

Analysis (submitted by manufacturer).—Moisture 3.8%, total solids 96.2%, ash 2.9%, potassium carbonate 1.4%, fat none, protein (N × 6.25) 8.7%, reducing sugars as maltose 71.1%, dextrins (by difference) 13.5%, carbohydrates (by difference) 86.6%.

Calories.—3.7 per gram; 105 per ounce.

BORCHERDT'S BRAND MALT SOUP EXTRACT WITH ADDED POTASSIUM CARBONATE, a concentrated nondiastatic barley malt extract with added potassium carbonate (1.1 Gm. to 100 Gm. of extract).

Analysis (submitted by manufacturer).—Moisture 21.8%, total solids 78.2%, ash 2.5%, potassium carbonate 1.1%, fat none, protein (N × 6.25) 6.4%, reducing sugars as maltose 57.6%, dextrins (by difference) 11.7%, carbohydrates (by difference) 69.3%, calcium (Ca) 20 mg. per hundred grams, chlorine (Cl) 10 mg. per hundred grams, iron (Fe) 0.6 mg. per hundred grams, magnesium (Mg) 90 mg. per hundred grams, phosphorus (P) 0.29%, potassium (K) 1.10%, silicon (Si) 40 mg. per hundred grams, sodium (Na) 80 mg. per hundred grams, sulfur (S) 50 mg. per hundred grams. Not diastatically active.

Calories.—3.0 per gram; 85 per ounce.

Vitamins.—In 1930 the product was reported to contain 2.1 Sherman-Spohn units of vitamin B complex per gram; 60 units per ounce.

Ed. Loeflund & Co., Grunbach near Stuttgart, Germany, product distributed by Schieffelin & Company, New York.

LOEFLUND'S MALT SOUP STOCK, a concentrated barley malt extract with 1.1 per cent of potassium carbonate and bicarbonate (ratio 1 to 0.8) added.

Analysis (submitted by manufacturer).—Moisture 23.0%, total solids 77.0%, ash 2.0%, fat none, protein (N × 6.25) 4.5%, reducing sugars as maltose 57 to 58%, dextrins (by difference) 12 to 13%, carbohydrates (by difference) 69 to 71%. Only slight diastatic activity retained.

Calories.—3.0 per gram; 85 per ounce.

Schieffelin & Company, New York. *See* Ed. Loeflund & Co., Grunbach near Stuttgart, Germany.

PRODUCTS OF MALT DIASTASE

The foods of this group are prepared by the action of malt diastase on starch. They are therefore essentially mixtures of dextrins and maltose. The source of the starch, the degree of digestion and therefore the proportions of dextrin and maltose are different for different products. The noncarbohydrate ingredients of these products are implied in the descriptive statements about individual products.

The listed products of the following firms stand accepted:

PLAIN PRODUCTS

The Baker Laboratories, Cleveland.

BAKER'S MELODEX PLAIN (WITHOUT ADDED SALT), essentially a mixture of maltose and dextrins, a dried extract of a cereal base (starch cereal from which bran and embryo have been removed) and malt.

Analysis (submitted by manufacturer).—Moisture 3.0%, total solids 97.0%, ash 1.0%, protein (N × 6.25) 0.3 to 0.5%, maltose 52.5%, dextrin 43.5%, carbohydrates (by difference) 95 7%.

Calories.—3.84 per gram; 109 per ounce.

Borcherdt Malt Extract Company, Chicago.

MALOS, a powder, essentially maltose, obtained by digestion of starch by malt diastase.

Analysis (submitted by manufacturer).—Moisture 2.0%, total solids 98 0%, ash 1.9%, fat none, protein (N × 6.25) 4.4%, reducing sugars, before inversion, as maltose 87.0%, dextrins (by difference) 4.7%, sodium (Na) 0.10%, potassium (K) 0.40%, calcium (Ca) 30 mg. per hundred grams, magnesium (Mg) 60 mg. per hundred grams, iron (Fe) 1 mg. per hundred grams, aluminum (Al) 10 mg. per hundred grams, silicon (Si) 20 mg. per hundred grams, chlorine (Cl) 10 mg. per hundred grams, sulfur (S) 60 mg. per hundred grams, phosphorus (P) 0.41%, p_H (10 per cent solution) 7.2.

Calories.—3.84 per gram; 109 per ounce.

Vitamins.—Biologic assay (1936) showed 0.6 international unit of vitamin B_1 per gram; 17.0 per ounce.

Malt-Diastase Company, Brooklyn.

MADICO BRAND MALTOSE-DEXTRIN (PLAIN [WITHOUT ADDED SALT]) "A," a spray-dried filtrate of diastatic barley malt and gelatinized starch, essentially maltose and dextrins.

Analysis (submitted by manufacturer).—Moisture 2.2%, total solids 97.8%, ash 0.8%, fat 0.04%, protein (N × 6.25) 1.2%, reducing sugars as anhydrous maltose 53.7%, dextrins (by difference) 40.9%, carbohydrates (by difference) 95.6%, acidity as lactic acid 0.2%.

Calories.—3.9 per gram; 111 per ounce.

The Maltine Company, New York.

MALTINE (PLAIN), a concentrated extract of diastatically active malted barley, wheat and oats and 3.9 per cent added alcohol.

Analysis (submitted by manufacturer).—Moisture (total volatile substances) 29.0%, alcohol by volume (15.6 C.) 3.9%, total solids 71.0%, ash 1.1%, fat none, protein (N × 6.25) 4.9%, maltose[10] 37.5%, dextrose[10] 12.7%, dextrins[10] 6.5%, carbohydrates (by difference) 65.0%. One gram of Maltine converts from 5 to 7 Gm. of starch to maltose and dextrins in thirty minutes at from 40 to 42 C.

Calories.—3 per gram; 85 per ounce.

Vitamins.—Biologic assay (1932) indicated that Maltine contains between 7 and 10 Sherman-Spohn units of vitamin B complex per

10. Browne, C. A.: Handbook of Sugar Analysis, New York, John Wiley & Sons, Inc., 1912, p. 490.

gram; 199 to 284 units per ounce. One gram was found equivalent to 3 Gm. of moist yeast in vitamin B_1 content and to 1 Gm. of moist yeast in vitamin G (riboflavin) content.

Mead Johnson & Company, Evansville, Ind.

MEAD'S BRAND DEXTRI-MALTOSE NO. 2 SALT FREE, essentially maltose and dextrins, the dried filtrate from an infusion of barley malt admixed with boiled starch (corn, potato or wheat flour, casaba or other starch may be used) and water.

Analysis (submitted by manufacturer).—Moisture 1.0%, total solids 99%, ash 0.5%, fat 0.2%, protein (N × 6.25) 0.2%, reducing sugar as maltose 55.0%, dextrins (by difference) 43.0%, carbohydrates (by difference) 98.6%.

Calories.—3.97 per gram; 113 per ounce.

Mellin's Food Company of North America, Boston.

MELLIN'S FOOD, a dried extract obtained from an infusion of wheat flour, wheat bran and malted barley admixed with potassium bicarbonate; essentially maltose, dextrins, proteins and mineral salts.

Analysis (submitted by manufacturer).—Moisture 5.6%, total solids 94.4%, ash 3.9%, fat 0.2%, protein (N × 6.25) 10.3%, reducing sugars as maltose 58.9%, dextrins (by difference) 20.7%, crude fiber 0.2%, carbohyrates other than crude fiber (by difference) 79.6%, potassium (K) 1.78%, sodium (Na) 80 mg per hundred grams, calcium (Ca) 20 mg. per hundred grams, magnesium (Mg) 90 mg. per hundred grams, iron (Fe) 5 mg. per hundred grams, copper (Cu) 0.9 mg. per hundred grams, manganese (Mn) 0.3 mg. per hundred grams, chlorine (Cl) 30 mg. per hundred grams, phosphorus (P) 0.32%.

Calories.—3.6 per gram; 102 per ounce; 25 per level tablespoonful.

Vitamins.—Biologic assay (1935) showed that Mellin's Food contains 4 Sherman-Chase (2 international) units of vitamin B_1 per gram; 114 Sherman-Chase (57 international) units per ounce. There may be considerable decrease in vitamin potency during long storage.

Scientific Sugars Company, Columbus, Ind. *See* Union Starch & Refining Company, Granite City, Ill.

Union Starch & Refining Company, Granite City, Ill., product distributed by Scientific Sugars Company, Columbus, Ind.

HIDEX, a drum-dried extract of an infusion of corn starch and barley malt, essentially dextrins and maltose.

Analysis (submitted by manufacturer).—Moisture 3.0%, total solids 97.0%, ash 0.5%, fat none, protein (N × 6.25) 0.5%, reducing sugars as maltose 32.0%, crude fiber none, dextrins (by difference) 64.0%.

Calories.—3.9 per gram; 111 per ounce.

PRODUCTS WITH ADDED SALT

The Baker Laboratories, Cleveland.

BAKER'S MELODEX WITH 2 PER CENT SODIUM CHLORIDE, a mixture of maltose and dextrins (Baker's Melodex Plain) with 2 per cent sodium chloride added.

Analysis (submitted by manufacturer).—Moisture 3.0%, total solids 97.0%, ash 3.0%, sodium chloride 2.0%, protein (N × 6.25) 0.3 to 0.5%, maltose 51.5%, dextrin 42.5%, carbohydrates (by difference) 95.7%.

Calories.—3.84 per gram; 109 per ounce.

BAKER'S MELODEX WITH 3 PER CENT POTASSIUM BICARBONATE, a mixture of maltose and dextrins (Baker's Melodex Plain) with 3 per cent potassium bicarbonate added.

Analysis (submitted by manufacturer).—Moisture 3.0%, total solids 97.0%, ash 1.0%, potassium bicarbonate 3.0%, protein (N × 6.25) 0.3 to 0.5%, maltose 51.0%, dextrin 42.0%, carbohydrates (by difference) 95.7%.

Calories.—3.84 per gram; 109 per ounce.

Malt-Diastase Company, Brooklyn.

MADICO BRAND MALTOSE-DEXTRIN WITH 2 PER CENT OF SODIUM CHLORIDE "B," essentially maltose and dextrins, Madico Brand Maltose-Dextrin (Plain) "A," with added sodium chloride (2 per cent).

Analysis (submitted by manufacturer).—The same as for Madico Brand Maltose-Dextrin (Plain) "A," except for the addition of salt.

MADICO BRAND MALTOSE-DEXTRIN WITH 3 PER CENT OF POTASSIUM BICARBONATE "C," essentially maltose and dextrins, Madico Brand Maltose-Dextrin (Plain) "A," with added potassium bicarbonate (3 per cent).

Analysis (submitted by manufacturer).—The same as for Madico Brand Maltose-Dextrin (Plain) "A," except for the addition of potassium bicarbonate.

Mead Johnson & Company, Evansville, Ind.

MEAD'S BRAND DEXTRI-MALTOSE NO. 1 WITH 2 PER CENT SODIUM CHLORIDE, essentially a mixture of maltose and dextrins (Mead's Brand Dextri-Maltose No. 2 Salt Free) with added sodium chloride (2 per cent).

Analysis (submitted by manufacturer).—Moisture 1%, total solids 99%, ash (less added salt) 0.5%, sodium chloride 1%, fat 0.2%, protein (N × 6.25) 0.2%, reducing sugars as maltose 54.1%, dextrins (by difference) 42.0%, carbohydrates (by difference) 97.1%.

Calories.—3.91 per gram; 111 per ounce.

MEAD'S BRAND DEXTRI-MALTOSE NO. 3 WITH 3 PER CENT POTASSIUM BICARBONATE, essentially a mixture of maltose and dextrins (Mead's Brand Dextri-Maltose No. 2 Salt Free) with added potassium bicarbonate (3 per cent).

Analysis (submitted by manufacturer).—Moisture 1%, total solids 99%, ash (less added potassium bicarbonate) 0.5%, added potassium bicarbonate 3.0%, fat 0.2%, protein (N × 6.25) 0.2%, reducing sugar as maltose 54.1%, dextrins (by difference) 41.0%, carbohydrates (by difference) 95.1%.

Calories.—3.81 per gram; 108 per ounce.

PRODUCTS WITH ADDED VITAMIN B_1

Mead Johnson & Company, Evansville, Ind.

MEAD'S BRAND DEXTRI-MALTOSE WITH EXTRACTS OF WHEAT EMBRYO AND YEAST, a powdered mixture of Mead's Dextri-Maltose No. 2 Salt Free (essentially maltose and dextrin) and extracts of wheat embryo and yeast.

Analysis (submitted by manufacturer).—Moisture ("vacuum" 75 C.) 1.0%, total solids 99.0%, ash 2%, fat none, protein (N × 6.25) 4%, reducing sugars as maltose 53%, dextrins (by difference) 40%, calcium (Ca) 20 mg. per hundred grams, chlorine (Cl) 0.13%, copper (Cu) 2 mg. per hundred grams, iron (Fe) 8 mg. per hundred grams, magnesium (Mg) 0.10%, phosphorus (P) 0.34%, potassium (K) 0.72%, sodium (Na) 0.23%.

Calories.—3.9 per gram; 111 per ounce.

Vitamins.—Protocols of biologic assay (1938) show that this product contains 7 international units of vitamin B_1, 200 per ounce, and 5.6 Sherman-Bourquin units of vitamin G (riboflavin) per gram, 160 per ounce.

E. R. Squibb & Sons, New York.

SQUIBB BRAND DEXTROSE AND MALTED WHEAT GERM EXTRACT, a powdered mixture of dextrose (65 per cent) and Squibb Malted Wheat Germ Extract (malted wheat germ, malt U. S. P. and water, 35 per cent); essentially dextrose, maltose and dextrins; U. S. patents 1,541,263 (June 9, 1925); 1,640,182 (Aug. 23, 1927); 1,640,193 (Aug. 23, 1927).

Analysis (submitted by manufacturer).—Moisture 1.0%, total solids 99.0%, ash 2.0%, fat none, soluble protein (albuminoid N × 6.25) 3.0%, soluble amino compounds and other nitrogenous compounds (amino

N × 6.25) 4.0%, dextrose [11] 60%, reducing sugars as maltose [11] 11%, dextrins [11] 18%, crude fiber none, total carbohydrates (by difference) 90.0%, iron (Fe) 4.0 mg. per hundred grams, copper (Cu) 1.0 mg. per hundred grams, manganese (Mn) 0.5 mg. per hundred grams.

Calories.—3.9 per gram; 111 per ounce.

Vitamins.—The vitamin content is that provided by the malted wheat germ extract, or 2.5 international units (1935) of vitamin B_1 and 3.5 micrograms of vitamin G (riboflavin) per gram. The latter was determined by biologic assay (1938) of Squibb Malted Wheat Germ Extract against crystalline riboflavin as the standard.

Other Carbohydrate Preparations

In this group are listed preparations that do not clearly fall into any of the foregoing classes, though some of them are closely related to the products that have been described. Their significant ingredients, with the exception of banana powder, have been discussed in other parts of this section.

Ripe bananas in raw, cooked and powdered form have proved useful in the treatment of celiac disease. The value of this fruit for this purpose may depend on the availability of its carbohydrate or on other unknown factors.

The carbohydrate preparations and related products, that fall in this group of preparations intended for infant feeding and which stand accepted, are as follows:

Corn Products Refining Company, New York.

KARO BRAND POWDERED CRYSTAL WHITE SYRUP, a spray-dried corn syrup prepared by the hydrolysis of corn starch with dilute hydrochloric acid (Crystal White Karo), essentially dextrins, maltose and dextrose.

Analysis (submitted by manufacturer).—Moisture 2 to 5%, total solids 95 to 98%, ash 0.3%, fat 0.1%, protein none, dextrins (free from starch) 53 to 55%, maltose 26 to 27%, dextrose [12] 16 to 17%. No protein reaction is obtained with (1) acetic acid and potassium ferrocyanide, (2) saturated sodium chloride and acetic acid, (3) trinitrophenol or (4) nitric acid and magnesium sulfate.

Calories.—3.9 per gram; 110 per ounce.

Du Barry and Company, San Francisco.

DU BARRY'S FOOD, a powdered mixture of red lentils and barley flours. The firm reported (1934) that a gruel consisting of 28 Gm. of Du Barry's Food, ½ pint (473 cc.) of water and 7 Gm. of sodium chloride cooked in a double boiler for twenty minutes lowers the curd tension of milk (710 cc.) boiled two minutes 17%, pasteurized milk 23% and certified milk 50%, as determined by the Hill method.

Analysis (submitted by manufacturer).—Moisture 7.8%, total solids 92.2%, ash 1.7%, fat 0.9%, protein (N × 6.25) 22.4%, reducing sugars as dextrose trace, sucrose (copper reduction method) 5 1%, starch (diastase method) 56.7%, dextrins (alcohol method) 4.6%, crude fiber 0.8%, carbohydrates other than crude fiber (by difference) 66.4%, iron (Fe) 11.7 mg. per hundred grams, copper (Cu) 0.8 mg. per hundred grams.

Calories.—3.6 per gram; 102 per ounce.

Vitamins.—According to biologic assay (1933) Du Barry's Food contains 2 Sherman-Spohn units of vitamin B complex per gram; 56 units per ounce.

Food Concentrates, Inc., New York. *See* United Fruit Company, New York.

---

11. Estimated from analysis of Malted Wheat Germ Extract and from the factory formula.

12. Steinhoff, G.: Zur Stärkesirupanalyse: Die Bestimmung von Glukose, Maltose und der Dextrine nebeneinander, Ztschr. f. Spiritusindust. 56: 64 (March 23) 1933.

Mead Johnson & Company, Evansville, Ind.

MEAD'S FLORENA, a partially dextrinized wheat flour prepared by cooking bags of patent wheat flour in water, baking at a low temperature and grinding.

Analysis (submitted by manufacturer).—Moisture 4.5%, total solids 95.5%, ash 0.5% fat 1.0%, protein (N × 5.7) 9.2%, crude fiber 0.3%, dextrins (alcohol precipitation method) 6.0%, carbohydrates other than crude fiber (by difference) 84.5%.

Calories.—3.8 per gram; 108 per ounce.

Merck & Co., Inc., Rahway, N. J.

MERCK'S BRAND BANANA POWDER spray-dried sieved ripe bananas. The natural enzymes are practically unimpaired. The powder is equivalent to four times as much ripe pulp; 2½ level tablespoonfuls of powder equals one average banana (except in vitamin potency, as indicated); 1 tablespoonful weighs 8 Gm.

Analysis (submitted by manufacturer).—Moisture (vacuum, 70 C) 2.5%, total solids 97.5%, ash 3.2%, fat 1.5%, protein (N × 6.25) 4.9%, reducing sugars as invert sugar 32.7%, sucrose (copper reduction method) 33.2%, dextrin (hydrolysis of water extract of sugar-free sample; copper reduction method) 9.6%, starch (pancreatin digestion of dextrin and sugar-free sample; polarimetric method) 7.8%, crude fiber 3.5%, carbohydrates other than crude fiber (by difference) 84.6%.

Calories.—3.7 per gram; 105 per ounce.

Vitamins.—A biologic assay (1936) indicated that the product contains 9.6 international units (9.6 U. S. P. units) of vitamin A per gram, 273 units per ounce; 0.6 Sherman-Chase (0.3 international) unit of vitamin B_1 per gram (1935 assay for vitamin B_1) 16 Sherman-Chase (8 international) units per ounce; 0.26 Sherman-LaMer unit (2.6 international units) of vitamin C per gram, 7 Sherman-LaMer (70 international) units per ounce (which is about one third of the vitamin C content of fresh banana pulp; 1.2 Sherman-Bourquin units of vitamin G per gram, 32 units per ounce.

Scientific Sugars Company, Columbus, Ind. *See* **Union Starch & Refining Company, Granite City, Ill.**

Union Starch & Refining Company, Granite City, Ill., product distributed by Scientific Sugars Company, Columbus, Ind.

CARTOSE, a filtered syrup prepared from dextrose or corn syrup, essentially dextrins, maltose and dextrose.

Analysis (submitted by manufacturer).—Moisture 25.8%, total solids 74.2%, ash 0.2%, crude protein 0.05%, dextrins 32.3%, maltose 31.2%, dextrose 10.4%.

Calories.—3.0 per gram; 85 per ounce; 122 per fluidounce.

Fermentability.—Data submitted by the manufacturer (1937) on the fermentability of Cartose and several other carbohydrate preparations by yeast as measured by the carbon dioxide generated after three and eight hours showed that Cartose ranks approximately midway in fermentability between dark table syrup and the high dextrin products, justifying the claim that Cartose is less readily fermented by yeast than is dark corn syrup.

United Fruit Company, New York, products distributed by Food Concentrates, Inc., New York.

BANANA POWDER, spray-dried sieved ripe bananas. The natural enzymes are practically unimpaired. The powder is equivalent to four times as much ripe pulp; 2½ level tablespoonfuls of powder equals one average banana (except in vitamin potency, as indicated); 1 tablespoonful weighs 8 Gm.

Analysis (submitted by manufacturer).—Moisture (vacuum, 70 C.) 2.5%, total solids 97.5%, ash 3.2%, fat 1.5%, protein (N × 6.25) 4.9%, reducing sugars as invert sugar 32.7% sucrose (copper reduction method) 33.2%, dextrin (hydrolysis of water extract of sugar-free sample; copper reduction method) 9.6%, starch (pancreatin digestion of dextrin and sugar-free sample; polarimetric method) 7.8%, crude fiber 3.3%, carbohydrates other than crude fiber (by difference) 84.6%.

Calories.—3.7 per gram; 105 per ounce.

Vitamins.—A biologic assay (1936) indicated that the product contains 9.6 international units (9.6 U. S. P. units) of vitamin A per gram, 273 units per ounce; 0.6 Sherman-Chase (0.3 international) unit of vitamin B_1 per gram (1935 assay for vitamin B_1), 16 Sherman-Chase (8 international) units per ounce; 0.26 Sherman-LaMer unit (2.6 international units) of vitamin C per gram, 7 Sherman-LaMer (70 international) units per ounce (which is about one third of the vitamin C content of fresh banana pulp); 1.2 Sherman-Bourquin units of vitamin G per gram, 32 units per ounce.

MELOTOSE No. 2; a powdered mixture of dextrose (55 per cent), dried ripe banana (25 per cent) and dried malt extract (20 per cent).

Analysis (submitted by manufacturer).—Moisture 1.5%, total solids 98.5%, ash 1.0%, fat 0.5%, protein (N × 6.25) 2.3%, crude fiber 1.0%, dextrose[13] 54.5% maltose[14] 7.7%, frutose and other sugars 25.8%, starch 1.7%, dextrin 3.8%, carbohydrates other than crude fiber (by difference) 93.7%.

Calories.—3.89 per gram; 110 per ounce.

MELOTOSE No. 3, a powdered mixture of lactose U. S. P. (75 per cent) and dried ripe banana (25 per cent).

Analysis (submitted by manufacturer).—Moisture 2.0%, total solids 98.0%, ash 1.0%, fat 0.3%, protein (N × 6.25) 1.3%, lactose[15] 73.5%, fructose and other sugars 18.3%, starch 1.6%, dextrin 1.0%, crude fiber 1.0%, carbohydrates other than crude fiber (by difference) 94.4%.

Calories.—3.86 per gram; 110 per ounce.

Vitamins.—Calculated on the basis of content of banana powder, the product may be expected to contain 68 international units of vitamin A, 2 international units of vitamin B_1, 17 international units of vitamin C, and 8 Sherman-Bourquin units of vitamin G (riboflavin) per ounce.

CEREAL PRODUCTS

Cereal preparations in finely divided form have long been introduced into the diet of the baby early in life. Nearly 2,000 years ago Soranus of Ephesus, who advised milk as the only food for the first six months of life, suggested adding to the baby's diet at the age of 6 months crumbs of bread or flour prepared in water or wine and sweetened with honey. The nurses of ancient Rome commonly fed farinaceous foods after the fortieth day. In the eighteenth century in England it was common practice to feed water pap, consisting of boiled bread and water, along with human milk up to the age of 2 years. As shown by early American pediatric writings, this custom was followed in the American colonies. Wherever infant feeding is discussed, there is advised the use of cereal preparations as the earliest food besides milk. More recently, individual cereal products have been advanced as "baby's first solid food." While this designation is historically accurate, it is obvious that the feeding of cereal products to babies antedates any noteworthy knowledge of nutritional values. In general, cereal products may be designated as "among baby's first solid foods" or as "one of the baby's first solid foods," as a discussion of the composition of cereals and the nutritional requirements of the baby will show.

13. By separate analysis of added dextrose; then by difference.
14. By separate analysis of malt extract; then by difference.
15. By separate analysis; then by difference.

Cereal preparations differ in composition and in nutritional value because of unequal distribution of important nutrients in the different parts of the grain. The principal component of cereals is starch, which makes up from 67 to 76 per cent of the weight of the endosperm of oats, wheat and corn. The germ, or embryo, contributes fat and iron and is a rich source of vitamin B_1 and a good source of vitamin G (riboflavin). The bran contains iron, calcium, phosphorus, vitamin B_1 and crude fiber. Products which are derived almost entirely from endosperm, such as farina and semolina, or from the outer layer of wheat endosperm are composed chiefly of starch and have less vitamin B_1 and G and iron than the whole grain. They also contain less crude fiber than whole grain, which is considered to be an advantage in the feeding of infants. Some cereal preparations are now marketed which contain added substances, such as wheat germ, yeast and iron salts.

The increase in the knowledge of nutrition enables one today to select among foods those which supply the greatest nutritional values. In feeding it is well to bear in mind the principal requirements of the growing infant. The young baby who is receiving suitably modified milk, cod liver oil (or some other source of vitamins A and D) and orange juice (or some other source of vitamin C) in customary and appropriate quantities has a large portion of his nutritional needs satisfied. The adequacy of only two of the known essential components of the diet is in question. One of these is vitamin B_1, and the other is iron. The evidence in general favors the view that the basic diet of the infant (milk, orange juice and cod liver oil) supplies an adequate amount of vitamin B_1, but there is evidence also that an additional supply of this factor would serve as a nutritional safeguard. At birth the baby has a small store of iron in the liver and a larger store in the hemoglobin of the blood. These stores are used up during the first few months of life. The administration of iron-containing foods is appropriate, as it is considered desirable to provide enough of this dietary essential to rebuild the stores of iron. The infant ordinarily must secure the extra iron and extra vitamin B_1 from the foods commonly added early in the first year of life, namely, cereal products, vegetables, fruits and egg yolk. It is apparent therefore that the cereal product fed to the baby might well be selected for its content of vitamin B_1 and of iron.

The Committee on Nutrition of the League of Nations has announced that it is definitely opposed to the including of cereal and cereal products in the diets of infants before the age of 6 months because many cereal products are poor in vitamins and available mineral elements and their inclusion in the diet decreases the intake of milk and other protective foods. The committee suggested that in place of cereals potatoes be fed and that at an early age all infants be given foods rich in iron, such as egg yolk, when well tolerated, or sieved green vegetables or carrots.

It is obvious that the blanket objections of the Committee of the League of Nations cannot apply to those cereal products which have been fortified with vitamin B_1 or with iron. Furthermore, it should be recalled that in Europe many babies are customarily fed much larger quantities of cereal products than has ever been the custom in the United States. It is scarcely possible, therefore, that the inclusion of small amounts of cereal products, in America, would ever result in the limitation of the intake of milk, although cereals might be substituted for protective foods.

Many pediatricians doubtless would be willing to concede the point about the importance of vitamin B_1 and iron in the diet of the baby and yet be unwilling to agree to the announcement of the Committee on Nutrition. The feeding of small amounts of cereal products by spoon early in life has been considered to be advantageous, although it may be difficult to demonstrate these advantages. Obviously those pediatricians who prefer to give small amounts of cereal preparations early in life could well select individual products which not only supply starch but also provide vitamin B_1 and iron. Other kinds of cereal products are discussed in section V, "Grain Products."

The listed products of the following firms stand accepted:

DRIED CEREAL PREPARATIONS

Mead Johnson & Company, Evansville, Ind.

MEAD'S BRAND CEREAL ENRICHED WITH MINERAL AND VITAMIN CONTAINING FOODS, a mixture of farina, oatmeal, wheat germ (15 per cent by weight of dry ingredients), yellow cornmeal, bone meal, dried alfalfa leaf meal, brewers' yeast and reduced iron heated to 71 C. for a few minutes. This product requires cooking in milk or water.

Analysis (submitted by manufacturer).—Moisture 7.0% total solids 93.0%, ash 3.2%, fat 3.0%, protein (N $\times$ 6.25) 15.0%, crude fiber 0.9%, carbohydrates other than crude fiber (by difference) 70.9%, calcium (Ca) 0.78%, phosphorus (P) 0.62%, iron (Fe) 30 mg. per hundred grams, copper (Cu) 1.3 mg. per hundred grams, magnesium (Mg) 0.13%, sodium (Na) 0.85%, potassium (K) 0.40%, chlorine (Cl) 1.28%, sulfur (S) 0.17%, silica (Si) 20 mg. per hundred grams.

Calories.—3.69 per gram; 105 per ounce.

Vitamins.—Protocols of biologic assay (1939) show that the product contains not less than 3.5 international units of vitamin B_1 per gram, 100 per ounce, and not less than 2.6 Sherman-Bourquin units of vitamin G (riboflavin) per gram, 70 per ounce.

Reports of clinical experiments have shown that Mead's Cereal is a useful preparation in the feeding of infants.[16]

DRIED COOKED CEREAL PREPARATIONS

Cerevim Products Corporation, New York.

CEREVIM, a flaked dried cooked mixture of wheat, oats, powdered skimmed milk, wheat germ (10 per cent by weight of dry ingredients), yellow corn meal, dried brewers' yeast, sodium chloride, barley and malt.

---

16. Tisdall, F. T.; Drake, T. G. H. and Brown, A.: A New Cereal Mixture Containing Vitamins and Mineral Elements. Am. J. Dis. Child. **40**: 791 (Oct.) 1930.
Ross, John R., and Burrill, Lida M.: The Effect of Cooking on the Digestibility of Cereals, J. Pediat. **4**: 654 (May) 1934. Blatt, Maurice L., and Schapiro, I. E.: Influence of a Special Cereal Mixture on Infant Development, Am. J. Dis. Child. **50**: 324 (Aug.) 1935.

Analysis (submitted by manufacturer).—Moisture 5.2%, total solids 94.8%, ash 3.4%, fat 3.0%, protein (N × 6.25) 20.9%, crude fiber 2.5%, carbohydrates other than crude fiber (by difference), 65.0%, phosphorus (P) 0.45%, potassium (K) 0.486%, sulfur (S) 0.211%, calcium (Ca) 0.28%, chloride 0.164%, sodium (Na) 0.160%, magnesium (Mg) 0.141%, silicon (Si) 19 mg. per hundred grams, iron (Fe) 6 mg. per hundred grams, copper (Cu) 3 mg. per hundred grams.

Calories.—3.81 per gram; 108 per ounce.

Vitamins.—Protocols of biologic assay (1939) submitted by the manufacturer show that Cerevim contains not less than 3.5 international units of vitamin B_1 per gram, 100 per ounce.

Gerber Products Company, Fremont, Mich.

GERBER'S BRAND DRY PRE-COOKED CEREAL FOOD, a flaked dried cooked mixture of wheat, semolina, yellow cornmeal, wheat germ, malt, dried Brewer's yeast, dicalcium phosphate ($CaHPO_4.2H_2O$), sodium chloride, and iron and ammonium citrates (U. S. P.).

Analysis (submitted by manufacturer).—Moisture 5.6%, total solids 94.4%, ash 4.5%, fat (ether extract) 1.3%, protein (N × 6.25) 12.4%, crude fiber 1.3%, carbohydrates other than crude fiber (by difference) 74.9%, calcium (as Ca) 0.675%, phosphorus (P) 0.7989%, iron (Fe) 0.0300%.

Calories.—3.60 per gram; 102 per ounce.

Vitamins.—Report of biologic assay (1939) submitted by the manufacturer indicates that the product contains approximately 2.8 international units of vitamin B_1 per gram, 80 per ounce, and 1.4 Sherman-Bourquin units of vitamin G (riboflavin) per gram, 40 per ounce.

Mead Johnson & Company, Evansville, Ind.

PABLUM, a flaked dried cooked mixture of farina, oatmeal, wheat germ, yellow cornmeal, bonemeal, sodium chloride, dried alfalfa leaf, dried Brewer's yeast, and iron (ferrum reductum-U. S. P.).

Analysis (submitted by manufacturer).—Moisture 7.0%, total solids 93.0%, ash 4.2%, fat (ether extract) 3.0%, protein (N × 6.25) 15.0%, crude fiber 0.9%, carbohydrates other than crude fiber (by difference) 69.9%, calcium (Ca) 0.78%, phosphorus (P) 0.62%, magnesium (Mg.) 0.13%, sodium (Na) 0.85%, potassium (K) 0.40%, chlorine (Cl) 1.28%, sulfur (S) 0.17%, iron (Fe) 30 mg. per hundred grams, copper (Cu) 1.3 mg. per hundred grams. silica (Si) 20 mg. per hundred grams.

Calories.—3.69 per gram; 105 per ounce.

Vitamins.—Protocols of biologic assay (1939) submitted by manufacturer show that Pablum contains not less than 3.5 international units of vitamin B_1 per gram, 100 per ounce, and not less than 2.5 Sherman-Bourquin units of vitamin G (riboflavin) per gram, 70 per ounce.

Reports of clinical experiments have shown that Pablum is a useful preparation in the feeding of infants.[17]

CANNED STRAINED CEREAL PREPARATIONS

Beech-Nut Packing Company, Canajoharie, N. Y.

BEECH-NUT BRAND STRAINED BLENDED CEREAL, a sieved cooked mixture of farina, oatmeal, wheat germ (10 per cent by weight of dry ingredients) and salt.

Analysis (submitted by manufacturer).—Moisture 86.5%, total solids 13.5%, ash 0.9%, sodium chloride (NaCl) 0.5%, fat 0.2%, protein (N × 6.25) 2.2%, crude fiber 0.2%, carbohydrates other than crude fiber (by difference) 10.0%, calcium (Ca) 0.005%, phosphorus (P) 0.037%, iron (Fe) 0.0003%.

---

17. Ross, John R., and Summerfeldt, Pearl: Haemoglobin of Normal Children and Certain Factors Influencing its Formation, Can. Med. Assoc. J. **34**: 155 (Feb.) 1936. Stearns, Genevieve, and Stinger, Dorothy: Iron Retention in Infancy, J. Nutr. **13**: 127 (Feb. 10) 1937. Tisdall, Fredrick F., and Drake, T. G. H.: The Utilization of Calcium, J. Nutr. **16**: 613 (Dec. 10) 1938. Ratner, Bret, and Gruehl, H. L.: Anaphylactogenic Properties of Certain Cereal Foods and Breadstuffs, Am. J. Dis. Child. **57**: 739 (April) 1939.

Calories.—0.5 per gram; 14 per ounce.

Vitamins.—According to report of biologic assay (1939) submitted by the manufacturer, the product contains 0.11 international units of vitamin B_1 per gram, 3 per ounce.

BEECH-NUT BRAND STRAINED FARINA, sieved cooked farina with salt.

Analysis (submitted by manufacturer).—Moisture 88.5%, total solids 11.5%, ash 0.7%, sodium chloride (NaCl) 0.5%, fat 0.01%, protein N × 6.25) 1.4%, crude fiber 0.1%, carbohydrates other than crude fiber (by difference) 9.3%, calcium (Ca) 0.003%, phosphorus (P) 0.01%, iron (Fe) 0.0001%.

Calories.—0.4 per gram; 11 per ounce.

BEECH-NUT BRAND STRAINED OATMEAL, sieved cooked oatmeal with salt.

Analysis (submitted by manufacturer).—Moisture 88.2%, total solids 11.8%, ash 0.9%, sodium chloride (NaCl) 0.5%, fat 0.3%, protein (N × 6.25) 2.2%, crude fiber 0.2%, carbohydrates other than crude fiber (by difference) 8.2%, calcium (Ca) 0.004%, phosphorus (P) 0.047%, iron (Fe) 0.0005%.

Calories.—0.4 per gram; 11 per ounce.

Vitamins.—According to report of biologic assay (1939) submitted by the manufacturer, the product contains 0.28 international units of vitamin B_1 per gram, 8 per ounce.

Harold H. Clapp, Inc., Rochester, N. Y.

CLAPP'S BRAND ORIGINAL WHEATHEART CEREAL, an unsieved cooked mixture of durum semolina, wheat germ (33 per cent by volume of dry ingredients), sugar and salt.

Analysis (submitted by manufacturer).— Moisture 86.6%, total solids 13.4%, ash 0.9%, fat 0.4%, protein (N × 6.25) 2.1%, crude fiber 0.2%, carbohydrates other than crude fiber (by difference) 9.8%.

Calories.—0.5 per gram; 14 per ounce.

Gerber Products Company, Fremont, Mich.

GERBER'S BRAND STRAINED CEREAL, LONG-COOKED IN MILK, a sieved cooked mixture of whole wheat, oats and wheat germ (9 per cent by weight of dry ingredients) cooked in milk. The coarse bran is sieved out.

Analysis (submitted by manufacturer).—Moisture 83.1%, total solids (vacuum, 4 inches of mercury, 70 C.) 16.9%, ash 0.7%, fat 2.8%, protein (N × 6.25) 3.6%, crude fiber 0.2%, carbohydrates other than crude fiber (by difference) 10.0%, iron (Fe) 1.0 mg. per hundred grams, calcium (Ca), 90 mg. per hundred grams, phosphorus (P) 50 mg. per hundred grams.

Calories.—0.8 per gram; 23 per ounce.

Vitamins.—According to a report received in 1934 this cereal contains 0.24 Sherman-Chase (0.12 international) unit of vitamin B_1 and 0.38 Sherman-Bourquin unit of vitamin G per gram; 7 Sherman-Chase units of vitamin B_1 and 11 Sherman-Bourquin units of vitamin G per ounce.

H. J. Heinz Company, Pittsburgh.

HEINZ BRAND SIEVED CEREAL, a sieved cooked mixture of equal amounts (by weight) of wheat embryo, farina, cracked whole wheat and rolled oats.

Analysis (submitted by manufacturer).—Moisture 88.4%, total solids 11.6%, ash 0.3%, fat 1.0%, protein (N × 6.25) 2.9%, crude fiber 0.2%, carbohydrates other than crude fiber (by difference) 7.2%, calcium (Ca) 10 mg. per hundred grams, phosphorus (P) 70 mg. per hundred grams, iron (Fe) 0.5 mg. per hundred grams.

Calories.—0.5 per gram; 14 per ounce.

Vitamins.—Report of biologic assay (1935) submitted by manufacturer indicates the presence of 0.45 Sherman-Chase (0.22 international) unit of vitamin B_1 and 0.24 Sherman-Bourquin unit of vitamin G per gram; 13 Sherman-Chase units of vitamin B_1 and 7 Sherman-Bourquin units of vitamin G per ounce.

The Larsen Company, Green Bay, Wis.

LARSEN'S BRAND SIEVED CEREAL, a sieved cooked mixture of whole wheat, whole milk, barley, soy beans, wheat germ (9.5 per cent by weight of dry ingredients) and sodium chloride.

Analysis (submitted by manufacturer).—Moisture 80.5%, total solids 19.5% ash 1.2%, fat 1.8%, protein (N × 6 25) 5.0%, crude fiber 0.09%, carbohydrates other than crude fiber (by difference) 11.4%, calcium (Ca) 0.106%, phosphorus (P) 0.330%, iron (Fe) 0.0013%; ratio of phosphorus to calcium 3.11; ratio of carbohydrate to protein 2.28.

Calories.—0 82 per gram; 23 per ounce.

Paley-Sachs Food Company, Houston, Texas.

MRS. PALEY'S BRAND SIEVED CEREAL, a canned sieved mixture of oats, cracked wheat, farina, yellow corn meal and wheat germ, cooked in milk.

Analysis (submitted by manufacturer).—Moisture 74.2%, total solids 25.8%, ash 0.7%, fat (ether extract) 1.1%, protein (N × 6 25) 4.3%, crude fiber 0.2%, carbohydrates other than crude fiber (by difference) 19.5%, iron (Fe) 1.1 mg. per hundred grams, phosphorus (P) 60 mg per hundred grams, calcium (Ca) 65 mg. per hundred grams.

Calories.—1.1 per gram; 31 per ounce.

Stokely Brothers & Company, Inc., Indianapolis.

STOKELY'S FOR BABY BRAND SPECIALLY PREPARED STRAINED CEREAL, a sieved cooked mixture of farina, rolled oats, wheat germ (13 per cent by weight of dry ingredients), barley flour, whole milk, soy bean flour, yellow corn meal, sodium chloride, tricalcium phosphate ($Ca_3[PO_4]_2$) and brewers' yeast.

Analysis (submitted by manufacturer) — Moisture 86.8%, total solids 13.2%, ash 1.2%, sodium chloride 0.5% fat 1.1%, protein (N × 6.25) 2.6%, crude fiber 0.3%, carbohydrates other than crude fiber (by difference) 8.0%, calcium (Ca) 0.26%, copper (Cu) 0.1 mg. per hundred grams, iron (Fe) 2.0 mg. per hundred grams, manganese (Mn) 0.3 mg. per hundred grams, phosphorus (P) 0.25%.

Calories.—0.5 per gram; 14 per ounce.

The following firms distribute under their own labels cereal products purchased from manufacturers of accepted products now privileged to use the Seal. The labels and advertising conform to the Rules and Decisions of the Council.

L. Bamberger & Company, Newark, N. J.

FRUITIDOR BRAND SIEVED CEREAL, a sieved cooked mixture of farina, rolled oats, wheat germ (13 per cent by weight of dry ingredients), barley flour, whole milk, soy bean flour, yellow corn meal, sodium chloride, tricalcium phosphate ($Ca_3[PO_4]_2$) and brewers' yeast.

Clover Farm Stores Corporation, Cleveland.

CLOVER FARM BRAND SIEVED CEREAL, a sieved cooked mixture of whole wheat, whole milk, barley, soy beans, wheat germ (9.5 per cent by weight of dry ingredients) and sodium chloride.

Haas, Baruch & Co., Los Angeles.

IRIS BRAND SIEVED CEREAL, a sieved cooked mixture of whole wheat, whole milk, barley, soy beans, wheat germ (9.5 per cent by weight of dry ingredients) and sodium chloride.

Hale-Halsell Co., McAlester, Okla.

HALE'S PRIDE BRAND SIEVED CEREAL, a sieved cooked mixture of whole wheat, whole milk, barley, soy beans, wheat germ (9.5 per cent by weight of dry ingredients) and sodium chloride.

A. Krasne, Inc., New York.

KRASDALE BRAND SIEVED CEREAL, a sieved cooked mixture of whole wheat, whole milk, barley, soy beans, wheat germ (9.5 per cent by weight of dry ingredients) and sodium chloride.

R. H. Macy & Company, Inc., New York.

MACY'S BRAND SIEVED CEREAL, a sieved cooked mixture of farina, rolled oats, wheat germ (13 per cent by weight of dry ingredients), barley flour, whole milk, soy bean flour, yellow corn meal, sodium chloride, tricalcium phosphate ($Ca_3[PO_4]_2$) and brewers' yeast.

Sweet Life Food Corporation, New York.

SWEET LIFE BRAND SIEVED CEREAL, a sieved cooked mixture of whole wheat, whole milk, barley, soy beans, wheat germ (9.5 per cent by weight of dry ingredients) and sodium chloride.

Uco Food Corporation, Newark, N. J.

UCO BRAND SIEVED CEREAL, a sieved cooked mixture of whole wheat, whole milk, barley, soy beans, wheat germ (9.5 per cent by weight of dry ingredients) and sodium chloride.

Winfield Wholesale Grocery Company, Wichita and Winfield, Kan.

WINFIELD SUPREME BRAND SIEVED CEREAL, a sieved cooked mixture of whole wheat, whole milk, barley, soy beans, wheat germ (9.5 per cent by weight of dry ingredients) and sodium chloride.

FRUITS, VEGETABLES AND OTHER PREPARATIONS

Homogenized, sieved or chopped food preparations because of their nutritive value and physical structure are useful foods for infant feeding and for certain types of therapeutic diets. Preparing strained foods in the home is relatively simple, and when properly prepared they are not inferior in nutritive value to the commercial products. Manufacturers of canned foods have met the demand for such preparations by marketing a variety of products. These may be divided conveniently into several groups:

1. Vegetables packed singly or in combination with other vegetables.

2. Vegetable combinations or "soups," which are sometimes packed with added cereal or beef broth.

3. Fruits packed singly or in combination with other fruits.

4. Meats packed singly, including beef, lamb and liver.

5. Products which are related to those just cited in that they are intended for the diet of the infant; they include cereals, which are sometimes prepared with added wheat germ or milk, and meat products, such as beef broth and so-called liver soup, which is composed of beef liver, mixed vegetables, whole cereals and beef broth.

Homogenized, sieved and chopped preparations differ in texture. Homogenized preparations have the finest subdivision of food particles and sieved preparations the next finest; chopped preparations have a coarser texture. Preparations having extremely fine subdivision of food particles can be given from the second or even the first month to about the fifth month of life, a period when one hesitates to give coarser foods. Coarser foods, such as the chopped preparations, should be given in the latter part of the first year. Because the baby must be prepared for adult table food, it is desirable to give separate vegetable and fruit preparations at least part of the time, especially toward the end of the first year.

Manufacture.—The methods of preparing commercially canned homogenized, sieved and chopped foods vary somewhat with the food and with the manufacturer. The raw materials are usually fresh fruits and vegetables, frequently grown and harvested under the supervision of the manufacturer. Some firms begin with fruits and vegetables that are already canned or with fruits which have been dried.

The general canning process includes washing and removal of undesirable material, together with peeling, skinning or blanching, according to the nature of the fruit or vegetable. In the preparation of chopped foods, the vegetable or fruit is mechanically chopped, precooked at temperatures below boiling and filled into cans, which are sealed and heat processed. In the preparation of foods with finely divided particles the vegetable or fruit is heated in a closed kettle under light steam pressure until it is soft enough for sieving. It is then forced through a cylindric steel or copper screen having fine apertures, usually 0.02 inch (0.05 cm.) in diameter. Coarse fibers that will not pass through the sieve are discarded. The sieved material is conducted to vacuum tanks, where the water content may be adjusted to secure the desired consistency. The product then is vacuum packed and heat processed. Homogenized foods are further subdivided when the strained material is forced through stainless steel valves under 4,000 to 4,500 pounds' pressure after which they are vacuum packed and heat processed.

Council Requirements.—Certain labeling requirements and allowable claims for accepted brands of canned, sieved or homogenized foods for infant feeding may well be mentioned at this point

Declaration of Added Salt or Sugar in Sieved Vegetables or Fruits.—Added salt or sugar in sieved vegetables or fruits intended for infant or invalid feeding or for special diets should be given appropriate and prominent declaration. This information may be of importance to physicians prescribing their use.

Declaration of Cereal as an Ingredient of Sieved Vegetable Soups.—Added cereal in sieved vegetable soups intended for infant feeding or for special diets should be given appropriate and prominent declaration on the main panel face of the package label.

Sulfur Dioxide in Infant Foods.—Small quantities of sulfur dioxide are permissible in fruit products specially prepared for infants or children, provided the quantity does not exceed that compatible with good manufacturing practice in the preparation of the dried fruit used.

Allowable Claims for the Vitamin and Mineral Content of Canned Fruits and Vegetables Intended for Infant Feeding.—Homogenized, sieved and chopped fruits and vegetables prepared for the feeding of infants or for special diets for older children or adults should retain in the highest degree consistent with efficient manufacturing methods the vitamin and the mineral content of the raw product. Sufficient experimental evi-

dence has accumulated to warrant the view that vitamin A and vitamin G (riboflavin) are little affected by good modern canning procedures. It also seems reasonable to believe that little of the natural mineral content of the food is lost in canning because no liquid other than that in which the food is blanched is discarded after the vegetables have been washed and otherwise prepared for canning. However, there is evidence that vitamins B_1 and C are more or less adversely affected by canning processes, the degree of destruction depending on the characteristics of the food itself, the time and temperature of processing and possibly other factors.

If the Council is in possession of satisfactory evidence that the manufacturing process of a product is designed to preserve vitamins which are easily destroyed by heat or oxidation or by both, the general claim will be recognized that the major portion of vitamin A and vitamin G (riboflavin) and the mineral content of the fresh food is retained. On the other hand, claims for the retention of vitamin B_1 or C or for retention of vitamins in general cannot be recognized unless they are supported by acceptable evidence of the potency of the finished product.

Methods of assay have been developed to such a point that the Council requires that advertising claims, at least for the vitamin B_1 and the vitamin C (ascorbic acid) content of canned strained foods, shall be based on assays of the individual product. Determination of ascorbic acid by titration with 2,6-dichlorophenolindophenol will be accepted for products for which it has been demonstrated that the results of chemical titration are in close agreement with the results of biologic assay. Bioassays of vitamin B_1 potency will be necessary.

Nutritional Value.—It may be estimated that a 6 or 7 month old baby who is taking, among other things, 24 ounces (710 cc.) of boiled cow's milk, 2 teaspoonfuls of cod liver oil, 3 to 5 ounces (89 to 148 cc.) of orange juice, the equivalent of ½ ounce (14 Gm.) of whole grain cereal (dry) and one egg yolk is receiving from these sources a daily total of approximately 28 Gm. of protein, 0.86 Gm. of calcium, 0.76 Gm. of phosphorus and 3.6 mg. of iron. This infant is also receiving approximately 7,000 U. S. P. units of vitamin A, 100 international units of vitamin B_1, 375 international units of vitamin C, more than 700 U. S. P. units of vitamin D and more than 400 Sherman-Bourquin units of vitamin G. Although the baby's requirements for these dietary essentials are not known with numerical accuracy, clinical experience indicates that with the possible exception of iron and vitamin B_1 the foregoing quantities of these factors are suitable under normal conditions; there are, of course, variations in the requirements at different ages. With these figures in mind, one may with profit consider the composition of canned homogenized, sieved and chopped foods (table 1) and the contribution that they make to the infant's diet.

TABLE 1.—*Composition of Canned Sieved and Chopped Foods for Infant Feeding (Submitted by Manufacturers)*

Product	Moisture, %	Total Solids, %	Ash, %	Sodium Chloride (NaCl), %	Fat,* %	Protein (N × 6.25), %	Crude Fiber, %	Carbohydrates,† %	Calories Per Gm.	Calories Per Oz.
H. A. Bashore Products, Inc.										
Bay Shore Brand Sieved										
Beef	81.0	19.0	0.9	...	1.1	15.5	0.1	1.4	0.8	23
Liver	78.7	21.3	1.0	...	3.5	15.0	0.04	1.8	1.0	28
Lamb	70.0	30.0	1.0	...	7.8	20.3	0.1	0.8	1.6	45
Beech-Nut Packing Co.										
Beech-Nut Brand Sieved										
Apples	87.1	12.9	0.2	...	0.2	0.2	0.5	11.8	0.5	14
Apricots	79.3	20.7	1.0	...	0.3	2.3	0.6	16.5	0.8	23
Beans, Green	93.5	6.5	1.4	0.5	0.1	1.1	1.1	2.8	0.2	6
Beets	91.3	8.7	1.5	0.5	0.0	1.2	0.6	5.4	0.3	9
Carrots	91.7	8.3	0.9	0.5	0.2	0.4	0.9	5.9	0.3	9
Peas	86.1	13.9	0.8	0.5	0.3	3.5	1.0	8.3	0.5	14
Prunes	69.5	30.5	0.7	...	0.2	0.1	0.6	28.9	1.2	34
Soup, Vegetable	88.9	11.1	1.0	0.5	0.0	1.3	0.8	8.0	0.4	11
Spinach‡	92.9	7.1	1.7	0.5	0.4	2.0	0.6	2.4	0.2	6
Beech-Nut Brand Chopped										
Apricots	73.9	26.1	1.1	...	0.1	1.3	0.9	22.7	0.97	28
Beets	91.1	8.9	1.3	...	0.04	1.4	0.6	5.6	0.28	8
Carrots	90.0	10.0	0.7	...	0.1	0.8	0.7	7.7	0.35	10
Green Beans	92.4	7.6	0.6	...	0.1	1.3	0.9	4.7	0.25	7
Prunes	69.6	30.4	0.6	...	0.1	1.0	0.7	28.0	1.17	33
Spinach	93.0	7.0	1.4	...	0.4	2.1	0.7	2.4	0.22	6
Vegetable Soup	88.5	11.5	0.4	...	0.1	1.2	0.4	9.4	0.43	12
California Fruit Krush Co.										
Williams Brand Sieved										
Prunes	74.0	26.0	0.8	...	0.5	1.8	1.4	20.9	1.0	28
California Prune & Apricot Growers Association										
Sunsweet Brand Sieved										
Prunes	68.6	31.4	0.7	...	0.1	1.0	0.6	29.0	1.2	34

Caribbean Canning Co., Inc.										
Caribbean Brand Strained										
Bananas	74.5	25.5	0.6	...	0.7	1.3	0.4	22.2	1.00	28.4
Clapp (Harold H.), Inc.										
Clapp's Brand Sieved										
Apples‡	85.8	14.2	0.4	..	0.7	0.1	2.1	10.9	0.5	14
Apricots	84.7	15.3	1.1	...	0.6	0.7	2.4	10.6	0.5	14
Asparagus‡	94.1	5.9	1.2	..§	0.2	1.4	0.5	2.6	0.2	6
Beef with Vegetables and Rice and Barley	86.3	13.7	1.3	...	0.9	4.2	0.3	7.0	0.53	15
Beans, Green	91.5	8.5	0.8	...§	0.2	1.6	0.9	5.0	0.3	8
Beans, Wax‡	92.5	7.5	1.2	0.5	0.1	1.2	0.8	4.2	0.2	6
Beets‡	90.5	9.5	0.4	0.3	0.2	0.9	2.4	5.6	0.3	9
Carrots‡	94.6	5.4	0.7	0.3	0.1	0.4	0.4	3.8	0.2	6
Mixed Greens	93.8	6.2	0.8	0.1	0.4	1.6	0.5	2.9	0.22	6
Peas‡	85.0	15.0	1.1	0.7	0.4	3.8	0.8	8.9	0.5	14
Prunes‖	79.0	21.0	0.7	...	1.2	0.7	2.0	16.4	0.8	23
Soup, Beef Broth	97.7	2.3	1.1	1.0	0.0	1.0	0.0	0.2	0.05	1
Soup, Baby (vegetables, meat broth and cereals)	88.6	11.4	1.4	0.5	0.1	1.1	0.2	8.6	0.4	11
Soup, Original Liver	86.8	13.2	1.4	0.3	0.5	3.3	0.2	7.8	0.5	14
Soup, Unstrained Vegetable with Cereal and Beef Broth	88.6	11.4	1.4	0.5	0.1	1.1	0.2	8.6	0.4	11
Soup, Vegetable	85.9	14.1	1.7	0.5	0.2	2.0	0.3	9.9	0.5	14
Spinach‡	95.4	4.6	1.2	0.5	0.3	1.2	0.5	1.4	0.1	3
Tomatoes‡	93.6	6.4	0.8	0.5	0.3	0.9	0.2	4.2	0.2	6
Clapp's Brand Chopped										
Apple Sauce	85.8	14.2	0.4	...	0.7	0.1	2.1	10.9	0.5	14
Beans, Green	91.1	8.9	0.9	0.5	0.3	1.6	1.1	5.0	0.3	8
Beets	91.5	8.5	1.0	0.5	0.2	1.0	0.5	5.7	0.3	8
Carrots	92.8	7.2	0.6	0.5	0.2	0.7	0.5	4.2	0.2	6
Mixed Greens	93.6	6.4	1.0	0.3	0.4	1.6	0.6	2.8	0.21	6
Prunes‖	70.0	30.0	0.7	...	1.5	1.1	2.4	24.3	1.2	34
Soup, Vegetable with Cereals and Beef Broth	84.6	15.4	1.2	0.6	0.4	1.4	0.5	12.1	0.6	16
Soup, Liver with Cereals and Beef Broth	86.8	13.3	1.1	0.5	0.4	3.1	0.3	7.8	0.5	14
Spinach	93.9	6.1	1.8	0.4	0.4	1.4	0.5	2.0	0.2	6

* Ether extract.
† Other than crude fiber, by difference
‡ The product was canned before being sieved.
§ Flavored with lemon juice.

TABLE 1.—*Composition of Canned Sieved and Chopped Foods for Infant Feeding (Submitted by Manufacturers)*—(*Continued*)

Product	Moisture, %	Total Solids, %	Ash, %	Sodium Chloride (NaCl), %	Fat,* %	Protein (N × 6.25), %	Crude Fiber, %	Carbohydrates,† %	Calories Per Gm.	Calories Per Oz.
The Elmhurst Packers, Inc.										
Warranty and Seakist Brands Sieved										
Apples‡	88.8	11.2	0.3	0.1	0.1	0.2	0.6	9.7	0.4	11
Apricots‡	85.7	14.3	0.5	0.01	0.1	0.8	0.8	11.5	0.5	14
Asparagus	91.7	8.3	0.9	0.1	0.1	3.4	0.7	3.2	0.3	9
Beans, Green	93.2	6.8	0.5	0.0	0.1	1.5	0.7	4.0	0.2	6
Beets	87.8	12.2	0.8	0.1	0.0	1.3	0.6	9.5	0.4	11
Carrots	88.9	11.1	0.8	0.1	0.1	1.0	0.7	8.5	0.4	11
Celery	93.6	6.4	1.0	0.3	0.1	0.8	0.8	3.7	0.2	6
Peaches‡	87.4	12.6	0.6	Trace	0.2	0.5	0.6	10.0	0.4	11
Peas	82.8	17.2	0.6	0.1	0.5	4.6	1.7	9.8	0.6	17
Prunes	72.0	28.0	0.9	0.0	0.2	1.0	0.6	24.8	1.1	31
Spinach	93.4	6.6	1.6	0.1	0.4	1.8	0.4	2.4	0.2	6
Tomatoes	91.6	8.4	0.7	0.1	0.1	1.2	0.3	5.6	0.3	9
Gerber Products Company										
Gerber Brand Sieved										
Apricots and Applesauce	82.5	17.5	0.5	...	0.2	0.5	0.4	16.0	0.7	20
Beans, Green	92.3	7.7	0.7	...	0.1	1.3	1.8	4.8	0.3	9
Beets	89.3	10.7	1.0	...	0.2	1.1	0.5	7.9	0.4	11
Carrots	91.2	8.8	0.8	...	0.2	0.7	0.6	6.5	0.3	9
Peas	86.8	13.2	0.7	...	0.3	3.6	0.4	8.2	0.5	14
Prunes	65.9	34.1	0.8	...	0.6	1.0	0.7	31.0	1.3	37
Liver Soup with Vegetables, Barley, Wheat Germ	85.9	14.1	0.98	...	0.8	4.0	0.4	7.9	0.55	15.6
Soup, Vegetable with Cereal and Beef	90.3	9.7	0.7	...§	0.2	1.7	0.4	6.7	0.4	11
Spinach	92.7	7.3	1.1	...	0.4	2.4	0.7	2.8	0.2	7
Tomatoes	86.3	13.7	1.0	...	0.1	2.4	0.5	9.7	0.5	14

Heinz (H. J.) Company									
Heinz Brand Sieved									
Apricots#	84.2	15.8	0.7	...	1.0	1.2	0.8	12.1	0.6	17
Apricots and Applesauce	82.8	17.2	0.6	...	0.1	0.6	0.7	14.4	0.6	17
Asparagus	91.0	9.0	0.5	0.1	0.3	1.9	0.8	5.5	0.32	9.1
Beans, Green	92.7	7.3	0.5	0.0	0.1	2.2	0.8	3.7	0.2	6
Beets	89.5	10.5	0.8	...	0.1	1.5	0.6	7.5	0.4	11
Carrots	92.4	7.6	0.7	0.1	0.1	0.9	0.7	5.2	0.3	9
Combination-Mixed Greens	92.7	7.3	1.3	...	0.2	2.3	1.2	2.3	0.2	6
Peas	84.3	15.7	0.6	0.0	0.5	4.9	1.0	8.7	0.6	17
Pears and Pineapple	84.9	15.1	0.4	0.05	0.04	0.4	1.0	12.9	0.54	15.3
Prunes§	69.0	31.0	0.7	...	0.2	1.1	0.8	27.5	1.2	34
Soup, Vegetables with Cereal and Yeast Extract	88.3	11.7	0.7	0.2	0.1	1.8	0.4	8.7	0.4	11
Soup, Beef and Liver with Vegetables	86.9	13.1	1.2	0.6	1.0	5.1	0.2	5.6	0.5	14
Spinach	93.7	6.3	1.4	0.1	0.5	2.2	0.7	1.5	0.2	6
Tomatoes	88.0	12.0	1.1	...	0.2	2.1	0.4	8.2	0.4	11
Larsen Company, The									
Larsen Brand Sieved									
Apples**	85.0	15.0	0.3	...	0.1	0.3	0.5	13.9	0.6	17
Apples and Apricots#	81.7	18.3	0.6	...	0.2	0.8	0.7	16.0	0.7	20
Apricots§	87.6	12.4	0.8	...	0.2	0.7	0.6	10.1	0.5	14
Beans, green	93.9	6.1	0.5	0.0††	0.2	1.6	0.7	3.1	0.2	6
Beets	89.7	10.3	0.5	0.0††	0.1	1.1	0.5	8.1	0.4	11
Carrots	92.6	7.4	0.4	0.1††	0.2	0.6	0.6	5.6	0.3	9
Celery	94.1	5.9	1.0	0.2††	0.2	1.0	0.8	2.9	0.2	6
Peas	86.0	14.0	0.4	0.0††	0.4	4.4	0.4	8.4	0.5	14
Prunes§	77.0	23.0	0.7	0.1	0.1	0.9	0.6	20.2	0.9	26
Soup, Vegetable with Cereal and Beef Extract	89.1	10.9	0.6	0.2††	0.2	1.7	0.3	8.1	0.4	12
Soup, Vegetable	85.3	14.7	1.1	...	0.2	2.2	0.5	10.7	0.5	14
Spinach	95.4	4.6	0.8	0.0††	0.4	1.7	0.4	1.3	0.2	6
Tomatoes	91.6	8.4	0.8	0.1††	0.3	1.4	0.4	5.5	0.3	9

§ A small amount of salt is added.
** A small amount of sugar is added.
# Either a fresh or canned product is used.
†† This figure is probably no longer correct as 0.25 per cent salt is now added.

Table 1.—*Composition of Canned Sieved and Chopped Foods for Infant Feeding (Submitted by Manufacturers)*—*(Continued)*

Product	Moisture, %	Total Solids, %	Ash, %	Sodium Chloride, (NaCl), %	Fat,* %	Protein (N × 6.25), %	Crude Fiber, %	Carbohydrates,† %	Calories Per Gm.	Calories Per Oz.
Libby, McNeill & Libby										
Libby's Brand Homogenized										
Formulated Combination No. 1	90.1	9.9	1.1	...	0.2	2.0	0.6	6.0	0.34	9.7
Formulated Combination No. 2	92.6	7.4	0.9	...	0.2	1.1	0.9	4.5	0.14	4.0
Formulated Combination No. 3	90.6	9.4	1.0	...	0.2	2.0	0.7	5.5	0.33	9.4
Formulated Combination No. 4	77.8	22.2	1.2	..	1.8	5.3	0.6	13.8	0.93	26.4
Formulated Combination No. 5	67.8	32.2	0.7	.	0.6	1.1	0.6	29.2	1.29	36.6
Formulated Combination No. 6	90.2	9.8	1.1	...	0.3	2.2	0.4	5.8	0.33	9.4
Carrots	91.9	8.1	1.2	0.6	0.1	0.8	0.8	5.2	0.23	6.5
Peas	85.4	14.6	1.1	0.4	0.1	3.5	1.8	8.1	0.49	13.9
Spinach	94.1	5.9	1.4	0.9	0.3	1.6	0.8	1.8	0.16	4.5
Lyndonville Canning Co.										
V. B. Junior Brand Sieved										
Apples	75.0	25.0	0.2	0.0	0.1	0.2	0.5	23.6	1.0	28
Paley-Sachs Food Co.										
Mrs. Paley's Brand Sieved										
Apricots‡‡	70.4	29.6	1.1	...	0.1	1.1	0.9	26.4	1.1	81
Apples	77.4	22.6	0.3	...	0.1	0.2	0.8	21.2	0.9	26
Asparagus	93.0	7.0	1.2	...§	0.3	2.2	0.4	2.9	0.2	6
Beans, Frijoles§§	77.0	23.0	1.1	...	0.2	5.7	1.0	15.0	0.8	23
Beans, Green	92.2	7.7	0.5	...	1.1	1.4	0.5	4.4	0.2	6
Beef	80.9	19.1	1.8	...	1.4	15.8	0.1	0.0	0.8	23
Beets	91.6	8.4	0.6	...	0.1	1.2	0.8	5.7	0.3	9
Carrots	90.0	10.0	0.8	...	0.2	1.0	0.8	7.2	0.3	9
Mixed Vegetables with Soya Bean, Dicalcium Phosphate and Wheat Germ	81.5	18.5	1.5	...	0.8	4.4	1.1	10.7	0.7	20

Peaches, Evaporated‡‡	73.5	26.5	1.0	...	0.3	1.6	0.5	23.1	1.0	28
Pears, Evaporated‡‡	72.4	27.6	0.5	..	0.1	0.6	1.4	25.0	1.0	28
Peas‡	84.1	15.9	1.2	...	0.3	4.7	0.6	9.1	0.6	17
Prunes, Evaporated§§	68.3	31.7	0.6	..	0.1	1.0	0.6	29.4	1.2	34
Soup, Beef Broth	97.1	2.9	1.1	...	...	1.7	...	0.1	0.1	3
Soup, Calf Liver with Vegetables and Cereal	83.1	16.9	0.9	..	0.6	4.6	0.6	10.2	0.6	17
Soup, Vegetable with Beef Broth and Cereal	84.2	15.8	1.1	...	0.2	2.6	1.0	10.9	0.5	14
Spinach	92.0	8.0	1.7	..	0.3	2.1	0.8	3.1	0.2	6
Squash	90.5	9.5	0.8	.	0.4	1.4	0.5	6.4	0.4	11
Tomatoes	93.5	6.5	1.0	..	0.1	1.1	0.3	4.0	0.2	6
Stokely Brothers & Company, Inc.										
Stokely Brand Sieved										
Apple Sauce	79.2	20.8	0.8	0.6	0.8	0.2	1.0	17.5	0.8	22
Apricots	75.8	24.2	1.0	...	0.1	1.3	0.8	21.0	0.9	26
Beans, Green	92.0	8.0	1.2	0.6	0.2	1.4	0.9	4.3	0.2	6
Beets	85.7	14.3	1.2	0.5	0.2	1.4	0.6	10.9	0.5	14
Carrots	89.7	10.3	0.9	0.3	0.0	1.1	0.8	7.5	0.3	9
Peas	86.6	13.4	1.1	0.7	0.4	3.5	0.8	7.6	0.5	14
Prunes	65.7	34.3	0.9	...	0.0	1.2	0.5	31.4	1.3	37
Soup, Beef Broth	98.2	1.8	1.1	0.8	0.0	0.8	0.0	0.0	0.0	1
Soup, Liver	84.3	15.7	2.3	1.8	0.5	3.8	0.9	8.2	0.5	15
Soup, Vegetable with Beef Broth	85.0	15.0	1.4	0.8	0.1	3.0	0.4	10.0	0.5	14
Spinach	92.7	7.3	1.6	0.8	0.3	2.3	0.8	2.2	0.2	6
Tomatoes	93.1	6.9	0.9	0.4	0.1	1.1	0.3	4.5	0.2	6
Soup, Unstrained, Vegetable with Cereal and Beef Extract	86.4	13.6	2.2	1.8	0.1	1.6	0.8	8.9	0.4	12
Van Camp Brand Sieved Products										
Analyses the same as for Stokely's Apricots, Green Beans, Peas, Prunes, Vegetable Soup with Beef Broth, Spinach, and Tomatoes										
Carrots	85.7	14.3	1.2	0.7	0.1	2.4	0.6	9.9	0.5	14

§§ A dried product was used.

‡‡ A dried product was used, and a small amount of sulfur dioxide is present.

The amounts of protein, fat, calories, calcium, phosphorus and vitamin G which may be furnished by 2 ounces (57 Gm.) of the majority of canned sieved foods are hardly to be considered significant additions to the baby's diet. On the other hand, some of these foods contain appreciable quantities of vitamins A and B_1 and iron, and a few, such as tomatoes, spinach and other greens, contain appreciable amounts of vitamin C. The sieved foods provide also crude fiber, iodine, copper and other substances.

It seems probable, in the light of present day evidence, that the average normal infant's requirements for vitamin A and vitamin C are adequately met by an intake of approximately 3,000 U. S. P. units of the former and about 300 international units of the latter. On this assumption it is obvious that the normal infant who is fed whole milk, cod liver oil and either orange or tomato juice in customary quantities is receiving ample supplies of vitamins A and C from these sources alone. However, one should not lose sight of the fact that nowadays a considerable number of infants may receive their entire quota of vitamin D from sources which, unlike cod or other fish liver oils, are devoid of vitamin A. For infants who receive no vitamin A other than that supplied by ordinary foods, the canned strained fruits and vegetables may be an important supplementary source of this essential vitamin.

That the quantities of vitamin B_1 supplied by vegetables may be important in infant feeding was suggested by the observations of Daniels, Byfield and Loughlin.[18] These workers reported that 100 cc. of vegetable soup prepared from comminuted carrots, turnips and celery and added to the milk feeding of a normal baby at the age of 4½ months resulted in marked stimulation of growth. The effects were comparable to those which were observed after the administration of an alcoholic extract of wheat embryo or an alcoholic extract of a similar vegetable mixture. The authors concluded, therefore, that increased growth was due to the vitamin B_1 present in the alcoholic extract of the products investigated. Later Hoobler and other workers found that many infants apparently require more of the antineuritic factor than is ordinarily furnished in milk.[19] They thought that an additional source of vitamin B_1 should be provided. If it is true that the vitamin B_1 intake of the normal infant under usual

18. Daniels, Amy L.; Byfield, A. H., and Loughlin, Rosemary: The Role of the Antineuritic Vitamin in the Artificial Feeding of Infants, Studies in Child Welfare, Iowa City, University of Iowa, 1921, vol. 1, no. 5.

19. Hoobler, B. R.: Symptomatology of Vitamin B Deficiency in Infants, J. A. M. A. **91**: 307 (Aug. 4) 1928; Use of Vitamin B in the Diet of Infants: Further Observations, ibid. **96**: 675 (Feb. 28) 1931 Dennett, R. H.: Routine Use of the Vitamin B Factor in Infant Feeding, ibid. **92**: 769 (March 9) 1929. Bloxsom, A. P.: Vitamin B Requirements in Infancy, Am. J. Dis. Child. **37**: 1161 (June) 1929. Waring, J. J.: Beriberi in Infants, ibid. **38**: 52 (July) 1929.

conditions is not far above his requirements, it may well be that the amount of this vitamin furnished by a number of commercially sieved foods is significant in his nutrition.

Sieved Foods as Sources of Iron.—It has now been more or less generally accepted that the quantities of iron furnished by either breast milk or cow's milk do not adequately meet the requirements of the normal infant. Nature provides for this dietary deficiency by supplying a reserve of iron in the liver and other tissues and in the blood itself of the child before birth.[20] This reserve supply might theoretically be expected to last until the child is about 6 months old, but it is usually exhausted considerably before this time. Studies on the metabolism of young, bottle-fed infants usually show a negative iron balance.[21] A slight degree of anemia appears to be more prevalent among infants considered normal than has been previously recognized. It has been concluded that the average baby is probably living on a relatively slight margin of safety with respect to its intake of iron and that for some babies the iron supplied by ordinary foods is inadequate.[22]

It has been suggested that the optimal iron requirement during the first year of life may be as high as 0.7 mg. per kilogram of body weight, or as much as a total of 5 mg. from 3 to 6 months and 10 mg. from 6 to 12 months of age.[23] If these large amounts of iron are indeed required, it is evident that the quantity of iron supplied by the basic foods enumerated in the foregoing paragraphs is inadequate and that all dietary sources of this mineral are important. Two ounces (57 Gm.) of commercially canned sieved foods may provide from 0.6 to 1.8 mg. of iron. Larger servings will of course supply correspondingly larger amounts. Whether the iron of all fruits and vegetables is effectively utilized by the baby is not clear at the present time. Contradictory results have been reported,[24] and further evidence is necessary. The fact remains, however, that canned sieved fruits and vegetables may supply what appear to be significant amounts of this essential dietary factor, as shown in table 2.

---

20. Stearns, Genevieve, and McKinley, J. B.: The Conservation of Blood Iron During the Period of Physiological Hemoglobin Destruction in Early Infancy, J. Nutrition **13**: 143 (Feb.) 1937.

21. Stearns, Genevieve, and Stinger, Dorothy: Iron Retention in Infancy, J. Nutrition **13**: 127 (Feb.) 1937.

22. Mackay, Helen M. M., and Goodfellow, Lorel: Nutritional Anaemia in Infancy with Special Reference to Iron Deficiency, Medical Research Council, Special Report Series, no. 157, London, His Majesty's Stationery Office, 1931. Elvehjem, C. A.; Siemers, Arlyle, and Mendenhall, Dorothy Reed: Effect of Iron and Copper Therapy on Hemoglobin Content of Blood of Infants, Am. J. Dis. Child. **50**: 28 (July) 1935.

23. Jeans, P. C.: Specific Factors in Nutrition, J. Pediat. **9**: 693 (Nov.) 1936.

24. Caldwell, G. W.: The Nutritive Value of Strained Vegetables in Infant Feeding, J. Pediat. **1**: 749 (Dec.) 1932. Schlutz, F. W.; Morse, Minerva, and Oldham, Helen: Vegetable Feeding in Young Infant: Influence on Gastro-Intestinal Motility and Mineral Retention, Am. J. Dis. Child. **46**: 757 (Oct.) 1933; The Influence of Fruit and Vegetable Feeding upon the Iron Metabolism of the Infant, J. Pediat. **3**: 225 (July) 1933. Jeans.[23]

TABLE 2—*Percentages of Calcium, Phosphorus and Iron in Canned Sieved Foods (Submitted by Manufacturers)*

Product	Calcium (Ca), %	Phosphorus (P), %	Iron (Fe), %
Beech Nut Packing Co			
Beech Nut Brand Sieved			
Apple Sauce	0.003	0.00	0.0004
Apricots	0.015	0.037	0.0011
Beans, Green	0.022	0.021	0.000[illegible]
Beets	0.02	0.014	0.000
Carrots	0.016	0.014	0.0004
Peas	0.01[illegible]	0.0[illegible]	0.0009
Prunes	0.00	0.02	0.000[illegible]
Soup, Vegetable	0.024	0.027	0.0005
Spinach	0.071	0.043	0.0012
Beech Nut Brand Chopped			
Apricots	0.015	0.0[illegible]7	0.0014
Beans, Green	0.017	0.024	0.0006
Beets	0.013	0.017	0.0004
Carrots	0.029	0.022	0.0003
Prunes	0.011	0.029	0.001
Soup, Vegetable	0.025	0.031	0.0002
Spinach	0.056	0.0[illegible]7	0.0011
Harold H. Clapp, Inc			
Clapp's Brand Sieved			
Beef with Vegetables and Rice and Barley	0.01[illegible]	0.0[illegible]6	0.0018
Mixed Greens	0.06	0.04	0.001
Clapp's Brand Chopped			
Mixed Greens	0.078	0.0358	0.002
Gerber Products Company			
Gerber's Brand Sieved			
Apricots and Applesauce	0.014	0.02	0.0027
Beans, Green	0.030	0.025	0.0015
Beets	0.016	0.020	0.0012
Carrots	0.027	0.022	0.0012
Peas	0.016	0.066	0.0017
Prunes	0.027	0.027	0.0050
Liver Soup with Vegetables, Barley, Wheat Germ	0.01[illegible]2	0.0803	0.0028
Soup, Vegetables with Barley and Wheat Germ	0.014	0.036	0.0017
Spinach	0.123	0.0[illegible]33	0.0010
Tomatoes	0.015	0.0327	0.0012
Heinz (H. J.) Company			
Heinz Brand Sieved			
Apricots	0.02	0.03	0.002
Apricots and Applesauce	0.01	0.02	0.0013
Asparagus	0.014	0.036	0.0010
Beans, Green	0.05	0.031	0.001
Beets	0.02	0.04	0.0016
Carrots	0.03	0.029	0.001
Combination Mixed Greens	0.17	0.05	0.0014
Peas	0.01	0.083	0.001
Prunes	0.03	0.03	0.0018
Soup, Vegetables with Cereal and Yeast Extract	0.03	0.03	0.0015

TABLE 2.—*Percentages of Calcium, Phosphorus and Iron in Canned Sieved Foods (Submitted by Manufacturers)—Continued*

Product	Calcium (Ca), %	Phosphorus (P), %	Iron (Fe), %
Heinz (H. J.) Company			
Heinz Brand Sieved—Continued			
Soup, Beef and Liver with Vegetables	0.025	0.19	0.0018
Spinach	0.057	0.038	0.001
Tomatoes	0.01	0.03	0.0016
Larsen Company, The			
Larsen's Brand Sieved			
Apples	0 009	0.025	0.0003
Apples and apricots	0.013	0.055	0.0012
Vegetable Soup	0.027	0.157	0.0009
Libby, McNeill & Libby			
Libby's Brand Homogenized			
Formulated Combination No. 1	0.018	0.056	0.0019
Formulated Combination No. 2	0.024	0.031	0.0014
Formulated Combination No. 3	0.031	0.054	0.0016
Formulated Combination No. 4	0.110	0.151	0.0011
Formulated Combination No. 5	0.027	0.063	0.0075
Formulated Combination No. 6	0.025	0.059	0.0030
Carrots	0.013	0.020	0.0012
Peas	0.011	0.033	0.0023
Spinach	0.023	0.007	0.0030
Paley-Sachs Food Co.			
Mrs. Paley's Brand Sieved			
Apples	0.006	0.02	0.0008
Asparagus	0.014	0.043	0.0074
Apricots	0.024	0.048	0.0023
Beans, Frijole	0.042	0.090	0.0013
Beans, Green	0.04	0.028	0.0024
Beef Broth	0.01	0.057	0.0034
Beets	0.024	0.032	0.0039
Carrots	0.055	0.033	0.0009
Mixed Vegetables with Soya Bean, Dicalcium Phosphate and Wheat Germ	0.246	0.137	0.0029
Peaches, Evaporated	0.022	0.043	0.0029
Pears, Evaporated	0.021	0.025	0.0011
Peas	0.015	0.059	0.001
Prunes, Evaporated	0.026	0.034	0.0021
Soup, Calf Liver with Vegetables and Cereal	0.028	0.081	0.0012
Soup, Vegetable with Beef Broth and Cereal	0.030	0.072	0.0008
Spinach	0.1	0.046	0.0083
Squash	0.021	0.041	0.0015
Tomatoes	0.019	0.015	0.0018
Stokely Brothers & Company, Inc.			
Stokely Brand Sieved			
Beans, Green	0.039	0.022	0.001
Peas	0.014	0.049	0.001
Spinach	0.118	0.042	0.002
Tomatoes	0.006	0.017	0.002
Van Camp Brand Sieved			
Carrots	0.019	0.033	0.001

Digestibility.—There is ample clinical evidence that commercially homogenized and sieved foods are well tolerated by the average baby and that digestive upsets caused by these foods are rare. When vegetables are first given, the digestive tract must gradually become accustomed to taking care of this type of food. During such transition periods rather large amounts of the vegetable food usually appear in the stools. The presence of such undigested material in an otherwise normal stool should not cause any fear that the baby is unable to tolerate these foods. Normal infants are able to digest homogenized and sieved foods after the first month of life.

A factor that is favorable to the ease of digestion of commercially homogenized and sieved foods is the fine state of division obtained with factory sieves which have extremely small perforations. It is for this reason that sieved foods also have an important place in certain therapeutic diets, particularly when these diets must be continued over long periods. Under such circumstances the commercially sieved foods, particularly vegetables and fruits, offer a considerable convenience to the consumer and may contribute to the diet important amounts of iron and of vitamins A and B_1 and possibly other factors.

Psychologic Importance of Variety in the Diet.—An important reason for introducing a variety of foods during the first year of life is the favorable effect on the food habits of the child. As all mothers and pediatricians know, babies readily form habits with respect to foods that, once formed, are not easily broken. For this reason it has been considered important to introduce a variety of flavors and textures and to accustom the child to taking food from a spoon at the earliest possible age. It has been reported regarding a group of 231 infants in Boston that the children fed "solid food" during the second and third months had better food habits and fewer food dislikes than those for whom such feeding was postponed until the seventh month.[25]

It is important that foods be finely divided when first included in the diet of the infant, but psychologically it is equally important that babies become accustomed to foods of increasing coarseness as soon as they are physiologically able to do so. There are many babies who are mistakenly fed homogenized or sieved fruits and vegetables throughout the period of infancy and even beyond. With such babies it is a common experience that they can be induced to eat coarser foods only with the greatest difficulty, when this is attempted later. It has been reported that this difficulty may last for years in the home, although it is more readily overcome in the hospital or the nursery school where the child can be taught by example of other children, without the presence of the mother. For these reasons the physician and the discerning mother should not

25. Glazier, M. M.: Advantages of Strained Solids in the Early Months of Infancy, J. Pediat. 3: 883 (Dec.) 1933.

lose sight of the fact that it is important to replace sieved foods by coarser foods, usually at about the sixth to the eighth month, at which time it is psychologically easy to effect the change. Chopped foods afford a convenient means of transition to coarser textures and in general they are suitable for use from about the ages of six to eighteen or twenty-four months. It should be remembered, however, that persistent and too long-continued use of chopped foods may defeat the main objective of the gradual promotion of the older infant and young child to the use of the customary table foods of the older members of the family.

The listed products of the following firms stand accepted:

H. B. Bashore Products, Inc., Los Angeles.

BAY SHORE BRAND SIEVED BEEF, LAMB and LIVER.

Beech-Nut Packing Co., Canajoharie, N. Y.

BEECH-NUT BRAND SIEVED APPLE SAUCE

Vitamins.—According to reports of biologic and chemical assays (1939) submitted by the manufacturer, the product contains 2 international units of vitamin B_1 and 7 international units of vitamin C per ounce.

BEECH-NUT BRAND SIEVED APRICOTS

Vitamins.—According to reports of biologic and chemical assays (1939) submitted by the manufacturer, the product contains 3 international units of vitamin B_1 and 14 international units of vitamin C per ounce.

BEECH-NUT BRAND SIEVED GREEN BEANS.

Vitamins.—According to reports of biologic and chemical assays (1939) submitted by the manufacturer, the product contains 4 international units of vitamin B_1 and 19 international units of vitamin C per ounce.

BEECH-NUT BRAND SIEVED BEETS.

Vitamins.—According to reports of biologic and chemical assays (1939) submitted by the manufacturer, the product contains 3 international units of vitamin B_1 and 12 international units of vitamin C per ounce.

BEECH-NUT BRAND SIEVED CARROTS.

Vitamins.—According to reports of biologic and chemical assays (1939) submitted by the manufacturer, the product contains 4 international units of vitamin B_1 and 11 international units of vitamin C per ounce.

BEECH-NUT BRAND SIEVED PEAS.

Vitamins.—According to reports of biologic and chemical assays (1939) submitted by the manufacturer, the product contains 7 international units of vitamin B_1 and 50 international units of vitamin C per ounce.

BEECH-NUT BRAND SIEVED PRUNES.

Vitamins.—According to reports of biologic and chemical assays (1939) submitted by the manufacturer, the product contains 4 international units of vitamin B_1 and 29 international units of vitamin C per ounce.

BEECH-NUT BRAND SIEVED VEGETABLE SOUP.

Vitamins.—According to reports of biologic and chemical assays (1939) submitted by the manufacturer, the product contains 3 international units of vitamin B_1 and 20 international units of vitamin C per ounce.

BEECH-NUT BRAND SIEVED SPINACH.

Vitamins.—According to reports of biologic and chemical assays (1939) submitted by the manufacturer, the product contains 3 international units of vitamin B_1 and 66 international units of vitamin C per ounce.

BEECH-NUT BRAND CHOPPED APRICOTS, prepared from cooked unsulfured dried fruit.

Vitamins.—According to reports of biologic and chemical assays (1939) submitted by the manufacturer, the product contains 3 international units of vitamin B_1 and 15 international units of vitamin C per ounce.

BEECH-NUT BRAND CHOPPED GREEN BEANS.

Vitamins.—According to reports of biologic and chemical assays (1939) submitted by the manufacturer, the product contains 4 international units of vitamin B_1 and 24 international units of vitamin C per ounce.

BEECH-NUT BRAND CHOPPED BEETS.

Vitamins.—According to reports of biologic and chemical assays (1939) submitted by the manufacturer, the product contains 3 international units of vitamin B_1 and 25 international units of vitamin C per ounce.

BEECH-NUT BRAND CHOPPED CARROTS.

Vitamins.—According to reports of biologic and chemical assays (1939) submitted by the manufacturer, the product contains 4 international units of vitamin B_1 and 11 international units of vitamin C per ounce.

BEECH-NUT BRAND CHOPPED PRUNES.

Vitamins.—According to reports of biologic and chemical assays (1939) submitted by the manufacturer, the product contains 5 international units of vitamin B_1 and 26 international units of vitamin C per ounce.

BEECH-NUT BRAND CHOPPED VEGETABLE SOUP, containing carrots, celery, cabbage, tomatoes, rice, barley and onion, slightly seasoned with sodium chloride.

Vitamins.—According to reports of biologic and chemical assays (1939) submitted by the manufacturer, the product contains 3 international units of vitamin B_1 and 22 international units of vitamin C per ounce.

BEECH-NUT BRAND CHOPPED SPINACH.

Vitamins.—According to reports of biologic and chemical assays (1939) submitted by the manufacturer, the product contains 3 international units of vitamin B_1 and 52 international units of vitamin C per ounce.

California Fruit Krush Co., San Francisco.

WILLIAMS BRAND SIEVED PRUNES.

California Prune & Apricot Growers Association, San Jose, Calif.

SUNSWEET BRAND SIEVED PRUNES.

SUNSWEET BRAND SIEVED WHIP-PRUNE FOR PRUNE WHIP.

Caribbean Canning Company, Inc., New Orleans.

CARIBBEAN BRAND STRAINED BANANAS.

Harold H. Clapp, Inc., Rochester, N. Y.

CLAPP'S BRAND SIEVED APPLES, APRICOTS, ASPARAGUS, BEEF WITH VEGETABLES, RICE AND BARLEY, GREEN BEANS, WAX BEANS, BEETS, CARROTS, PEAS, PRUNES FLAVORED WITH LEMON JUICE, BEEF BROTH, BABY SOUP, ORIGINAL LIVER SOUP, VEGETABLE SOUP, UNSTRAINED VEGETABLE SOUP, SPINACH and TOMATOES.

CLAPP'S BRAND SIEVED MIXED GREENS, a mixture of equal portions of kale, lettuce and Swiss chard.

CLAPP'S BRAND CHOPPED MIXED GREENS, a mixture of equal portions of kale, lettuce and Swiss chard.

CLAPP'S BRAND CHOPPED APPLE SAUCE, GREEN BEANS, BEETS, CARROTS, PRUNES FLAVORED WITH LEMON JUICE, SPINACH, VEGETABLE SOUP WITH CEREALS AND BEEF BROTH, LIVER SOUP WITH CEREALS AND BEEF BROTH.

The Elmhurst Packers, Inc., Oakland, Calif.

WARRANTY and SEAKIST BRANDS SIEVED APPLES, APRICOTS, ASPARAGUS, GREEN BEANS, BEETS, CARROTS, CELERY, PEACHES, PEAS, PRUNES, SPINACH and TOMATOES.

Gerber Products Co., Fremont, Mich.

GERBER BRAND SIEVED APRICOT and APPLE SAUCE.

Vitamins.—The product was reported (1938) to contain 867 international (U. S. P) units of vitamin A, 2.5 international units of vitamin B_1 and 4 international units of vitamin C per ounce.

GERBER BRAND SIEVED GREEN BEANS.

Vitamins.—The product was reported (1938) to contain 344 international (U. S. P.) units of vitamin A, 3 international units of vitamin B_1 and 17 international units of vitamin C per ounce.

GERBER BRAND SIEVED BEETS.

Vitamins.—The product was reported (1938) to contain 1 international (U. S. P.) unit of vitamin B_1 per ounce.

GERBER BRAND SIEVED CARROTS.

Vitamins.—The product was reported (1938) to contain 1,887 international (U. S. P.) units of vitamin A per ounce.

GERBER'S BRAND STRAINED LIVER SOUP WITH VEGETABLES, BARLEY AND WHEAT GERM.

GERBER BRAND SIEVED PEAS.

Vitamins.—The product was reported (1938) to contain 327 international (U. S. P.) units of vitamin A, 8 international units of vitamin B_1 and 45 international units of vitamin C per ounce.

GERBER BRAND SIEVED PRUNES.

Vitamins.—The firm reported (1938) that the product contains 175 international (U. S. P.) units of vitamin A per ounce.

GERBER BRAND SIEVED VEGETABLE SOUP WITH CEREAL and BEEF.

Vitamins.—The product was reported (1938) to contain 522 international (U. S. P.) units of vitamin A and 4.5 international units of vitamin B_1 per ounce.

GERBER BRAND SIEVED SPINACH.

Vitamins.—The product was reported (1938) to contain 3,339 international (U. S. P.) units of vitamin A, 1.5 international units of vitamin B_1 and 78 international units of vitamin C per ounce.

GERBER BRAND SIEVED TOMATOES.

Vitamins.—The product was reported (1938) to contain 1,100 international (U. S. P.) units of vitamin A, 7 international units of vitamin B_1 and 75 international units of vitamin C per ounce.

H. J. Heinz Company, Pittsburgh.

HEINZ BRAND SIEVED GREEN BEANS, BEETS, CARROTS, PEAS, PRUNES FLAVORED WITH LEMON JUICE, VEGETABLE SOUP WITH CEREAL AND YEAST EXTRACT, SPINACH and TOMATOES.

HEINZ BRAND SIEVED APRICOTS.

Vitamins.—Biologic assays (1935) showed the product to contain 175 Sherman-Munsell (130 U. S. P.) units of vitamin A, 4 Sherman (2 international) units of vitamin B_1 and 10 Sherman-Bourquin units of vitamin G per ounce. Chemical titration (1935) showed the vitamin C content to be 45 international units per ounce.

HEINZ BRAND SIEVED APRICOTS and APPLESAUCE.

Vitamins.—Biologic assays (1935) showed the product to contain 360 Sherman-Munsell (270 U. S. P.) units of vitamin A, 6 Sherman (3 international) units of vitamin B_1 and 5 Sherman-Bourquin units of vitamin G per ounce. Chemical titration (1935) showed the vitamin C content to be 25 international units per ounce.

HEINZ BRAND SIEVED ASPARAGUS.

Vitamins.—Protocols of biologic assay submitted by manufacturer (1939) show that this product contains 16.5 U. S. P. units of vitamin A, 0.31 international units of vitamin B_1 and 0.55 Sherman-Bourquin units of vitamin G per gram; 468.6, 9.8 and 15.6 per ounce. Chemical titration (1939) shows that the product contains 0.2 mg. ascorbic acid per gram; 5.6 mg. per ounce or 112 international units of vitamin C per ounce.

HEINZ BRAND SIEVED COMBINATION-MIXED GREENS.

Vitamins.—Biologic assays (1935) showed the product to contain 380 Sherman-Munsell (285 U. S. P.) units of vitamin A, 13 Sherman-Chase (6.5 international) units of vitamin B_1 and 14 Sherman-Bourquin units of vitamin G per ounce. Chemical titration (1935) showed the vitamin C content to be 123 international units per ounce.

HEINZ BRAND SIEVED BEEF and LIVER SOUP WITH VEGETABLES.

Vitamins.—Biologic assays (1937) showed the product to contain 2,000 international (U. S. P.) units of vitamin A, 15 Sherman (7.5 international) units of vitamin B_1 and 25 Sherman-Bourquin units of vitamin G per ounce. Chemical titration (1939) showed the vitamin C content to be 57 international units per ounce.

HEINZ BRAND SIEVED PEARS AND PINEAPPLE.

Vitamins.—Protocols of biologic assay (1939) submitted by the manufacturer indicate that the product contains 1.7 international units of vitamin A per gram, 50 per ounce; 0.24 international units of vitamin B_1 per gram, 7 per ounce; 0.17 Sherman-Bourquin units of vitamin G (riboflavin) per gram, 5 per ounce; and according to report of chemical titration (1939) 0.6 international units of vitamin C per gram, 17 per ounce.

Libby, McNeill & Libby, Chicago.

LIBBY'S BRAND HOMOGENIZED BABY FOODS FORMULATED COMBINATION NUMBER 1, containing peas, beets and asparagus, in equal quantities, with small amounts of added water and sodium chloride.

Vitamins.—Protocols of biologic assay (1938) show that the product contains 3.3 U. S. P. units of vitamin A per gram, 94 per ounce, 0.19 international units of vitamin B_1 per gram, 5.5 per ounce; 1.68 international units of vitamin C per gram, 48 per ounce and 0.28 Sherman-Bourquin units of vitamin G (riboflavin) per gram, 8 per ounce.

LIBBY'S BRAND HOMOGENIZED BABY FOODS FORMULATED COMBINATION NUMBER 2, containing pumpkin, stringless beans and tomatoes (skin and seeds removed), in equal quantities, with small amounts of added water and sodium chloride.

Vitamins.—Protocols of biologic assay (1938) show that the product contains 20 U. S. P. units of vitamin A per gram, 554 per ounce; 0.14 international units of vitamin B_1 per gram, 4.2 per ounce; 1.12 international units of vitamin C per gram, 31.81 per ounce; 0.15 Sherman-Bourquin units of vitamin G (riboflavin) per gram, 4.2 per ounce.

LIBBY'S BRAND HOMOGENIZED BABY FOODS FORMULATED COMBINATION NUMBER 3, containing carrots, spinach and peas, in equal quantities, with small amounts of added water and sodium chloride.

Vitamins.—Protocols of biologic assay (1938) show that the product contains 30 U. S. P. units of vitamin A per gram, 850 per ounce; 0.19 international units of vitamin B_1 per gram, 5.5 per ounce; 1.63 international units of vitamin C per gram, 46.29 per ounce; 0.26 Sherman-Bourquin units of vitamin G (riboflavin) per gram, 7.5 per ounce.

LIBBY'S BRAND HOMOGENIZED BABY FOODS FORMULATED COMBINATION NUMBER 4, containing whole milk, whole wheat flour and soya flour, with a small amount of sodium chloride.

Vitamins.—Protocols of biologic assay (1938) show that the product contains 1.8 U. S. P. units of vitamin A per gram, 52 per ounce; no report of vitamin B_1; 0.28 international units of vitamin C per gram, 8 per ounce; no report of vitamin G (riboflavin).

LIBBY'S BRAND HOMOGENIZED BABY FOODS FORMULATED COMBINATION NUMBER 5, containing strained stewed prunes, with small amounts of lemon juice and pineapple juice.

Vitamins.—Protocols of biologic assay (1938) show that the product contains 7.1 U. S. P. units of vitamin A per gram, 200 per ounce; 0.16 international units of vitamin B_1 per gram, 4.8 per ounce; 2.12 international units of vitamin C per gram, 60.21 per ounce; 0.35 Sherman-Bourquin units of vitamin G (riboflavin) per gram, 10.0 per ounce.

LIBBY'S BRAND HOMOGENIZED BABY FOODS FORMULATED COMBINATION NUMBER 6, containing tomato juice, celery, carrots, chicken livers, barley flour and water, slightly seasoned with onion and sodium chloride.

Vitamins.—Protocols of biologic assay (1938) show that the product contains 57 U. S. P. units of vitamin A per gram, 1,630 per ounce; 0.26 international units of vitamin B_1 per gram, 7.5 per ounce; 0.76 international units of vitamin C per gram, 22 per ounce; 0.53 Sherman-Bourquin units of vitamin G (riboflavin) per gram, 15.0 per ounce.

LIBBY'S BRAND HOMOGENIZED CARROTS, PEAS and SPINACH.

The Larsen Company, Green Bay, Wis.

LARSEN BRAND SIEVED APPLES, APPLES AND APRICOTS, APRICOTS, GREEN BEANS, BEETS, CARROTS, CELERY, PEAS, PRUNES FLAVORED WITH LEMON JUICE, VEGETABLE SOUP, VEGETABLE SOUP WITH CEREAL AND BEEF BROTH, SPINACH and TOMATOES.

Lyndonville Canning Co., Lyndonville, N. Y.

V. B. JUNIOR BRAND SIEVED APPLES.

Paley-Sachs Food Company, Houston, Texas.

MRS. PALEY'S BRAND SIEVED APRICOTS, APPLES, ASPARAGUS, FRIJOLE BEANS, GREEN BEANS, BEEF, BEETS, CARROTS, EVAPORATED PEACHES, EVAPORATED PEARS, EVAPORATED PRUNES, MIXED VEGETABLES WITH SOYA BEAN, DICALCIUM PHOSPHATE AND WHEAT GERM, PEAS, SPINACH, SQUASH, TOMATOES, BEEF BROTH, CALF LIVER SOUP WITH VEGETABLES AND CEREAL, and VEGETABLE SOUP WITH BEEF BROTH AND CEREAL.

Stokely Brothers & Company, Inc., Indianapolis.

STOKELY BRAND SIEVED APPLE SAUCE, APRICOTS, GREEN BEANS, BEETS, CARROTS, PEAS, PRUNES, BEEF BROTH, LIVER SOUP, VEGETABLE SOUP WITH BEEF BROTH, UNSTRAINED VEGETABLE SOUP WITH CEREALS AND BEEF BROTH, SPINACH and TOMATOES.

Products distributed by Van Camp, Inc.

VAN CAMP BRAND SIEVED APRICOTS, GREEN BEANS, CARROTS, PEAS, PRUNES, VEGETABLE SOUP WITH BEEF BROTH, SPINACH and TOMATOES.

The Van Camp Packing Company, Inc., Indianapolis. *See* Stokely Brothers & Company, Inc.

The following firms distribute under their own labels canned sieved and unsieved infant foods purchased from manufacturers of accepted products now privileged to use the Seal of Acceptance. The labels and advertising conform to the Rules and Decisions of the Council.

The W. L. Adamson Co., Dayton, Ohio.

A-C BRAND STRAINED BEETS, CARROTS, CELERY, GREEN BEANS, PEAS, PRUNES FLAVORED WITH LEMON JUICE, VEGETABLES WITH CEREAL AND BEEF BROTH, SPINACH and TOMATOES.

L. Bamberger & Company, Newark, N. J.

FRUITIDOR BRAND STRAINED APPLESAUCE, GREEN BEANS, CARROTS, PEAS, PRUNES, SPINACH, TOMATOES, BEEF BROTH, LIVER SOUP WITH VEGETABLES AND CEREALS, VEGETABLE SOUP WITH BEEF BROTH AND CEREAL, and UNSTRAINED VEGETABLE SOUP WITH BEEF BROTH AND CEREAL.

The John Blaul's Sons Co., Cedar Rapids, Iowa.

BBBB BRAND STRAINED APPLES, APRICOTS, GREEN BEANS, BEETS, CARROTS, CELERY, PEAS, PRUNES FLAVORED WITH LEMON JUICE, SPINACH, TOMATOES and VEGETABLES WITH CEREAL AND BEEF BROTH.

G. E. Bursley & Co., Fort Wayne, Elkhart, Marion, Richmond and South Bend, Ind.

LITTLE ELF BRAND SIEVED BEETS, CARROTS, CELERY, GREEN BEANS, PEAS, PRUNES FLAVORED WITH LEMON JUICE, VEGETABLES WITH CEREAL AND BEEF BROTH, SPINACH and TOMATOES.

Campbell Holton & Co., Bloomington, Ill.

Happy Hour Brand Strained Beets, Carrots, Celery, Green Beans, Peas, Prunes Flavored with Lemon Juice, Vegetables with Cereal and Beef Broth, Spinach and Tomatoes.

Clover Farm Stores Corporation, Cleveland.

Clover Farm Brand Strained Apples, Apricots, Beets, Carrots, Celery, Green Beans, Peas, Prunes Flavored with Lemon Juice, Spinach, Vegetables with Cereal and Beef Broth and Tomatoes.

Drake & Company, Easton, Pa.

Drake Brand Strained Apples, Apricots, Green Beans, Beets, Carrots, Celery, Peas, Prunes Flavored with Lemon Juice, Spinach, Tomatoes and Vegetables with Cereal and Beef Broth.

Fine Foods, Inc., Seattle and Minneapolis. *See* Gamble-Robinson Company, Minneapolis.

Gamble-Robinson Company, Minneapolis, products disrtibuted by Fine Foods, Inc., Seattle and Minneapolis.

Stanby Brand Sieved Apples, Apples and Apricots, Apricots, Green Beans, Beets, Carrots, Celery, Peas, Prunes Flavored with Lemon Juice, Vegetable Soup, Vegetable Soup with Cereal and Beef Broth, Spinach and Tomatoes.

General Grocer Company, St. Louis.

American Lady Brand Strained Beets, Carrots, Celery, Green Beans, Peas, Prunes Flavored with Lemon Juice, Vegetables with Cereal and Beef Broth, Spinach and Tomatoes.

Haas, Baruch & Co., Los Angeles.

Iris Brand Sieved Apples, Apricots, Asparagus, Beets, Carrots, Celery, Green Beans, Peaches, Peas, Prunes, Spinach and Tomatoes.

Haas Brothers, San Francisco, Oakland and Fresno, Calif.

Trupak Brand Strained Apple Sauce, Apricots, Asparagus, Beets, Carrots, Celery, Green Beans, Peaches, Peas, Prunes, Spinach and Tomatoes.

Hale-Halsell Co., McAlester, Okla.

Hale's Pride Brand Strained Apples, Apricots, Green Beans, Beets, Carrots, Celery, Peas, Prunes, Spinach, Tomatoes and Vegetables with Cereal and Beef Broth.

Charles Hewitt & Sons Co., Des Moines, Iowa.

Opal Brand Strained Beets, Carrots, Celery, Green Beans, Peas, Prunes Flavored with Lemon Juice, Vegetables with Cereal and Beef Broth, Spinach and Tomatoes.

Independent Grocers Alliance Distributing Co., Chicago.

I. G. A. Brand Strained Beets, Carrots, Celery, Green Beans, Peas, Prunes Flavored with Lemon Juice, Vegetables with Cereal and Beef Broth, Spinach and Tomatoes.

The Janszen Company, Cincinnati.

Dot Brand Strained Beets, Carrots, Celery, Green Beans, Peas, Prunes Flavored with Lemon Juice, Vegetables with Cereal and Beef Broth, Spinach and Tomatoes.

Joyce-Laughlin Co., Peoria, Ill.

Re-Joyce Brand Strained Beets, Carrots, Celery, Green Beans, Peas, Prunes Flavored with Lemon Juice, Vegetables with Cereal and Beef Broth, Spinach and Tomatoes.

Kothe, Wells & Bauer Co., Indianapolis.

Ko-We-Ba Brand Strained Beets, Carrots, Celery, Green Beans, Peas, Prunes Flavored with Lemon Juice, Vegetables with Cereal and Beef Broth, Spinach and Tomatoes.

A. Krasne, Inc., New York.

KRASDALE BRAND STRAINED APPLES, APRICOTS, GREEN BEANS, BEETS, CELERY, CARROTS, PEAS, PRUNES, SPINACH, TOMATOES and VEGETABLES WITH CEREAL AND BEEF BROTH.

R. H. Macy & Co., Inc., New York.

MACY'S BRAND STRAINED APPLE SAUCE, APRICOTS, ASPARAGUS, BEETS, CARROTS, GREEN BEANS, PEAS, PRUNES, VEGETABLE SOUP, BEEF BROTH, LIVER SOUP, UNSTRAINED VEGETABLE SOUP WITH BEEF BROTH AND CEREAL, SPINACH and TOMATOES.

Market Wholesale Grocers, Inc., Chicago.

ARISTO BRAND STRAINED BEETS, CARROTS, CELERY, GREEN BEANS, PEAS, PRUNES FLAVORED WITH LEMON JUICE, SPINACH and TOMATOES.

National Retailer-Owned Grocers, Inc., Chicago.

SHURFINE BRAND SIEVED APPLES, CARROTS, GREEN BEANS, PEAS, PRUNES, SPINACH and VEGETABLES WITH CEREAL AND BEEF BROTH.

A. H. Perfect & Co., Fort Wayne, Richmond and Huntington, Ind., Xenia, Ohio, and Sturgis, Mich.

EAVEY'S E BRAND STRAINED BEETS, CARROTS, CELERY, GREEN BEANS, PEAS, PRUNES FLAVORED WITH LEMON JUICE, VEGETABLES WITH CEREAL AND BEEF BROTH, SPINACH and TOMATOES.

Plee-Zing, Inc., Chicago.

PLEE-ZING BRAND STRAINED BEETS, CARROTS, CELERY, GREEN BEANS, PEAS, PRUNES FLAVORED WITH LEMON JUICE, VEGETABLES WITH CEREAL AND BEEF BROTH, SPINACH and TOMATOES.

The Ranney-Davis Mercantile Company, Arkansas City and Wichita, Kan.

RANNEY'S BRAND STRAINED APPLES, APRICOTS, GREEN BEANS, BEETS, CARROTS, CELERY, PEAS, PRUNES FLAVORED WITH LEMON JUICE, SPINACH, TOMATOES and VEGETABLES WITH CEREAL AND BEEF BROTH.

Red & White Corporation, Chicago.

RED & WHITE BRAND STRAINED BEETS, CARROTS, CELERY, GREEN BEANS, PEAS, PRUNES FLAVORED WITH LEMON JUICE, VEGETABLES WITH CEREAL AND BEEF BROTH, SPINACH and TOMATOES.

Reid, Murdoch & Co., Chicago.

MONARCH BRAND STRAINED APPLESAUCE, CARROTS, GREEN BEANS, PEAS, PRUNES FLAVORED WITH LEMON JUICE, VEGETABLE SOUP WITH CEREAL AND BEEF BROTH and SPINACH.

Rival Foods, Inc., Cambridge, Mass.

RIVAL BRAND STRAINED BEETS, CARROTS, CELERY, GREEN BEANS, PEAS, PRUNES FLAVORED WITH LEMON JUICE, VEGETABLES WITH CEREAL AND BEEF BROTH, SPINACH and TOMATOES.

Roundy, Peckham & Dexter Co., Milwaukee.

ROUNDY'S SUPREME BRAND STRAINED BEETS, CARROTS, CELERY, GREEN BEANS, PEAS, PRUNES FLAVORED WITH LEMON JUICE, VEGETABLES WITH CEREAL AND BEEF BROTH, SPINACH and TOMATOES.

Scudder-Gale Grocery Co., Quincy, Ill.

ROBIN BRAND STRAINED APPLES, APRICOTS, GREEN BEANS, BEETS, CARROTS, CELERY, PEAS, PRUNES FLAVORED WITH LEMON JUICE, SPINACH, TOMATOES and VEGETABLES WITH CEREAL AND BEEF BROTH.

John Sexton & Co., Chicago.

EDELWEISS BRAND STRAINED BEETS, STRING BEANS, CARROTS, PEAS, PRUNES, SPINACH and VEGETABLE SOUP WITH CEREAL AND BEEF BROTH.

Steele-Wedeles Company, Chicago.

SAVOY BRAND STRAINED BEETS, CARROTS, GREEN BEANS, PEAS, PRUNES FLAVORED WITH LEMON JUICE, VEGETABLES WITH CEREAL AND BEEF BROTH and SPINACH.

Sweet Life Food Corporation, New York.

SWEET LIFE BRAND STRAINED APPLES, APRICOTS, GREEN BEANS, BEETS, CARROTS, CELERY, PEAS, PRUNES, SPINACH, TOMATOES and VEGETABLES WITH CEREAL AND BEEF BROTH

H. P. Taylor Jr., Inc., Richmond, Va.

POCAHONTAS BRAND STRAINED APPLES, APRICOTS, BEETS, CARROTS, CELERY, GREEN BEANS, PEAS, PRUNES, VEGETABLES WITH CEREAL AND BEEF BROTH, SPINACH and TOMATOES.

Twin City Wholesale Grocer Co., St. Paul, Minneapolis, and Fargo, N. D.

FAIRWAY WHITE LABEL BRAND STRAINED BEETS, CARROTS, CELERY, GREEN BEANS, PEAS, PRUNES FLAVORED WITH LEMON JUICE, VEGETABLES WITH CEREAL AND BEEF BROTH, SPINACH and TOMATOES

Twin Ports Wholesale Grocer Co., Duluth, Minn., and Superior, Wis.

FAIRWAY WHITE LABEL BRAND STRAINED BEETS, CARROTS, CELERY, GREEN BEANS, PEAS, PRUNES FLAVORED WITH LEMON JUICE, VEGETABLES WITH CEREAL AND BEEF BROTH, SPINACH and TOMATOES.

Uco Food Corporation, Newark, N. J.

UCO BRAND STRAINED APPLES, APRICOTS, APPLES AND APRICOTS, BEETS, CARROTS, CELERY, GREEN BEANS, PEAS, PRUNES FLAVORED WITH LEMON JUICE, VEGETABLES WITH CEREAL AND BEEF BROTH, SPINACH, TOMATOES and VEGETABLE SOUP (carrots, potatoes, barley, green beans, peas, celery, tomatoes, spinach and a small amount of sodium chloride).

Waples-Platter Company, Fort Worth, Texas.

WHITE SWAN BRAND STRAINED BEETS, CARROTS, CELERY, GREEN BEANS, PEAS, PRUNES FLAVORED WITH LEMON JUICE, VEGETABLES WITH CEREAL AND BEEF BROTH, SPINACH and TOMATOES

Wellman, Peck & Co., San Francisco.

WELLMAN BRAND STRAINED APPLES, APRICOTS, ASPARAGUS, BEETS, CARROTS, CELERY, GREEN BEANS, PEACHES, PEAS, PRUNES, SPINACH and TOMATOES.

Winfield Wholesale Grocer Co., Wichita and Winfield, Kan.

WINFIELD SUPREME BRAND STRAINED APPLES, APRICOTS, APPLES AND APRICOTS, BEETS, CARROTS, CELERY, GREEN BEANS, PEAS, PRUNES FLAVORED WITH LEMON JUICE, VEGETABLES WITH CEREAL AND BEEF BROTH, SPINACH, TOMATOES and VEGETABLE SOUP (carrots, potatoes, barley, green beans, peas, celery, tomatoes, spinach and a small amount of sodium chloride).

Wood County Grocery Co., Wisconsin Rapids, Wis.

FAIRWAY WHITE LABEL BRAND STRAINED BEETS, CARROTS, CELERY, GREEN BEANS, PEAS, PRUNES FLAVORED WITH LEMON JUICE, VEGETABLES WITH CEREAL AND BEEF BROTH, SPINACH and TOMATOES.

DRIED APPLE POWDER

Use of Apple in the Management of Diarrhea.—The use of scraped raw apples as a home remedy for diarrhea can be traced back for many years in Germany and other European countries. Schachter [26] refers to an English book published in 1775 which describes the use of the fruit treatment (apples preferred) in dysentery. Heisler [27] reported in 1928 that the apple diet had been used in the Children's Clinic at Königsfeld for twenty years or more and before that had been a familiar

26. Schachter, M.: Quelques données sur l'histoire de la cure de fruits et spécialement sur la cure de pommes selon Moro-Heisler, Méd. inf. **41**: 37 (Feb.) 1934.

27. Heisler, A.: Dennoch Landarzt, München, Verlag der Ärztliche Rundschau, 1928.

household remedy in the Schwartzwald. Moro [28] of Heidelberg is usually credited with standardizing and introducing the apple diet to the medical profession. The use of apples in the treatment of diarrhea was first reported in the American literature by Birnberg [29] in 1933.

Dried apple powder prepared under the sponsorship of the Munich Children's Clinic has been used in Europe since 1931 and is reported to produce results similar to those obtained with scraped raw apple pulp.[30] The apple powder is in fact considered by some clinicians superior to the scraped apple pulp for children under 1 year of age. The powdered apple must be kept in a tight container to prevent absorption of moisture. The powder is usually given (in from 4 to 10 per cent solutions) in amounts varying from a total of 24 to 36 Gm. for babies under 1 year, or from 80 to 100 Gm. for older children. The apple powder is sometimes dissolved in boiled water or weak tea but may also be given in diluted skimmed milk. Leffkowitz [31] recommends for mild cases in young infants a mixture consisting of equal parts of skimmed milk and water in which 5 per cent of apple powder is dissolved. Sugar is omitted for the first two or three days and the mixture given in the volume to which the infant is accustomed. Thus the infant usually receives from 30 to 45 Gm. of apple powder daily, which Leffkowitz considers the maximum amount advisable. On the second or third day 5 per cent of a dextrin-maltose preparation is incorporated. After the fourth or fifth day the apple powder is gradually decreased and the concentration of milk and sugar increased until the infant is receiving eventually his normal feeding mixture. In severe and chronic cases Leffkowitz administers a 2 to 5 per cent solution of apple powder in weak tea for the first six to twelve hours, and the return to the normal diet after normal stools have appeared is even more gradual than in the milder cases.

The Physiologic Basis for the Apple Regimen.—Various theories [32] have been advanced ascribing the success of this diet to some component of the apple. It has been suggested that the astringent action of the tannic acid compounds which

---

28. Moro, E.: Zwei Tage Apfeldiät (roh und gerieben) zur Behandlung diarrhoischer Zustande im Kindesalter, Klin. Wchnschr. **8**: 2414 (Dec. 24) 1929.

29. Birnberg, T. L.: Raw Apple Diet in the Treatment of Diarrheal Conditions in Children, Am. J. Dis. Child. **45**: 18 (Jan.) 1933.

30. Wiskott, A.: Verwendung von Frischapfelpulver in der Behandlung kindlicher Durchfallserkrankungen, Klin. Wchnschr. **10**: 1252 (July 4) 1931. Schmidt, H. A.: Die Aplonadiät bei Ernährungsstörungen im Säuglingsalter, Kinderärtzl. Praxis **4**: 221 (May) 1933. de Rohan Barondes, R.: Apple Powder: Its Application to Intestinal Disorders; A Simplification and Improvement on the Heissler-Moro Raw Apple Diet, Brit. J. Child. Dis. **34**: 48 (Jan.-March) 1937.

31. Leffkowitz, M.: Behandlung diarrhöischer Zustände besonders im Säuglingsalter mit Apfelpulver, Therap. d. Gegenw. **73**: 44 (Jan.) 1932.

32. Manville, I. A.; Bradway, Elizabeth M., and McMinis, Avoca S.: The Use of Apple Powder in the Treatment of Diarrheal Conditions and Its Rationale, Canad. M. A. J. **36**: 223 (March) 1937. Also the articles listed in note 5.

are present in small amounts in the apple aids in protecting the mucous membrane of the gastro-intestinal tract, but there is little direct evidence in favor of this view. Other investigators have attributed the beneficial effects of the apple to the malic and other fruit acids present. In support of this theory is the observation that certain fruit juices such as lemon and currant juice have been observed to produce effects somewhat similar to those obtained with scraped apple. But apple sauce which has been rendered alkaline by the addition of sodium hydroxide has been shown to be as effective as the untreated fruit, an observation which is a serious obstacle in the way of the acceptance of the acid theory. Perhaps the hypothesis which is most frequently advanced is that the effectiveness of the apple may be attributed chiefly to pectin. This theory is supported by the observation that pectin alone or preparations of pectin and agar are reported to be practically as efficacious as raw apple pulp.[33] Pectin has been assumed to exert its effect by removal of toxic substances because of its colloidal properties and its buffering action, and also because it may serve as a source of galacturonic acid in the intestine. There is evidence that rabbits fed pectin can handle more readily a toxic substance such as menthol, which is detoxicated by coupling with glycuronic acid and excreted in the urine.[34] Much more evidence will be needed, however, before the precise mechanisms involved are made clear.

In 1937, the Council reviewed[35] the evidence then available and concluded that the apple is useful as a therapeutic agent in the dietary management of diarrhea. The mechanism responsible for the reported success of this diet is not clear.

Apple powder when suitably prepared is a wholesome food and offers a convenient preparation for use in the management of diarrhea of infancy and childhood. It should be emphasized, however, that the use of the fresh or dried apple does not obviate the necessity for other measures, including parenteral administration of fluids when indicated, the careful selection of a suitable transition diet, and competent pediatric supervision.

The listed products of the following firms stand accepted:

Appella Corporation, Yakima, Wash.

APPELLA APPLE POWDER, powdered dried apple pulp from several varieties of apples selected for their high content of pectin and uronic acid. This product is useful in the dietary management of diarrhea.

Analysis (submitted by manufacturer).—Moisture 2.0%, total solids 98.0%, ash 1.8%, fat (ether extract) 2.5%, protein (N × 6.25) 1.5%, crude fiber 6.7%, reducing sugars before inversion 52.0%, sucrose [(total

33. Hunt, J. S.: Observations on the Use of Raw Apple Diet and Pectin-Agar Mixtures in Pediatric Diarrheas, Arch. Pediat. **53**: 736 (Nov.) 1936. Winters, M.; Tompkins, C. A., and Crook, G. W.: Pectin-Aga Diets in the Treatment of Bacillary Dysentery of Infants and Children, J. Pediat. **14**: 788 (June) 1939.

34. Manville, I. A.; Bradway, Elizabeth M., and McMinis, Avoca S.: Pectin as a Detoxication Mechanism, Am. J. Digest. Dis. & Nutrition **3**: 570 (Oct.) 1936.

35. Report of the Council on Foods, The Apple in the Management of Diarrhea in Children, J. A. M. A. **109**: 1636 (Nov. 13) 1937.

reducing sugars after inversion minus reducing sugars) × 0.95] 17.1%, pectin (alcohol precipitate) 5.2%, uronic acids 9.2%, total carbohydrates other than crude fiber (by difference) 84.1%, tannin and coloring matter 1.4%, total sulfurous acid 0.01%, total acidity (as malic acid) 2.9%. p_H 3.5. Alkalinity of ash, equivalent to 240 cc. of 0.1 N acid/100 Gm powder. Sodium (Na) 0.11%, potassium (K) 0.87%, calcium (Ca) 0.015%, magnesium (Mg) 0.029%, copper (Cu) 0.0008%, iron (Fe) 0.0125%, phosphorus (P) 0.0014%, chloride 0.216%, total sulfur (S) 0.137%, silica (SiO_2) 0.01%, sulfur dioxide 0.0004%.

Calories.—3.7 per gram; 95 per ounce.

Frederick Stearns and Company, Detroit.

STEARNS BRAND APPELLA APPLE POWDER, powdered dried apple pulp from several varieties of apples selected for their high content of pectin and uronic acid. This product is useful in the dietary management of diarrhea.

Analysis (submitted by manufacturer).—Moisture 2.0%, total solids 98.0%, ash 1.8%, fat (ether extract) 2.5%, protein (N × 6.25) 1.5%, crude fiber 6.7%, reducing sugars before inversion 52.0%, sucrose [(total reducing sugars after inversion minus reducing sugars) × 0.95] 17.1%, pectin (alcohol precipitate) 5.2%, uronic acids 9.2%, total carbohydrates other than crude fiber (by difference) 84.1%, tannin and coloring matter 1.4%, total sulfurous acid 0.01%, total acidity (as malic acid) 2.9%, p_H 3.5. Alkalinity of ash, equivalent to 240 cc. of 0.1 N acid/100 Gm. powder. Sodium (Na) 0.11%, potassium (K) 0.87%, calcium (Ca) 0.015%, magnesium (Mg) 0.029%, copper (Cu) 0.0008%, iron (Fe) 0.0125%, phosphorus (P) 0.0014%, chloride 0.216%, total sulfur (S) 0.137%, silica (SiO_2) 0.01%, sulfur dioxide 0.0004%.

Calories.—3.7 per gram; 95 per ounce.

SECTION VII

Meats, Fish and Sea Foods

MEAT AND MEAT PRODUCTS

The animal products broadly classed as meats are, as will be described, important foods, and their consumption in the United States is relatively high. The annual per capita consumption of all meats in 1931, the last year for which official records are available, was 133 pounds (60 Kg.). Included in the term meat, as used in this section, are meat cuts (steaks, roasts, etc.), muscular organs (tongue, heart and tripe) and nonmuscular organs (liver, kidney, sweetbreads, brain) of cattle, sheep and hogs. All of these foods are valuable for their protein content and some have other components of nutritional value.

Composition and Nutritional Value

MEAT CUTS

Meat cuts are composed of variable amounts of muscle, connective tissue and fatty tissue. The relative amount of connective tissue (comprising walls of blood vessels, cartilage, tendons and intercellular vessels) determines the toughness of the meat. Mitchell, Zimmerman and Hamilton [1] measured the toughness of meat by a method which involved the determination of nitrogen as collagen and elastin, the proteins of connective tissue. Expressed in terms of the percentage of total nitrogen, the amount of collagen in beef rib ranged from 2.5 to 9.4 per cent and that of elastin from 4.7 to 8.7 per cent. In beef shank the percentage of total nitrogen as collagen and elastin was greater: The amount of collagen ranged from 6.2 to 7.5 per cent and that of elastin from 12 to 14.4 per cent. Long and Pittman [2] reported that collagen and elastin did not seriously affect utilization of nitrogen.

The fatty tissue, that is, the deposits of fat distributed in a fine state throughout the muscle tissue, consists chiefly of triglycerides of palmitic, stearic and oleic acids. Fatty tissue may contain some vitamin A, depending on the ration of the animal before slaughter.

Analyses of the many cuts of meat were separately summarized by Atwater and Bryant [3] in 1906 according to the amount

1. Mitchell, H. H.; Zimmerman, R. L., and Hamilton, T. S.: The Determination of the Amount of Connective Tissue in Meats, J. Biol. Chem. **71**: 379 (Jan.) 1927.

2. Long, Z., and Pittman, M. S.: Utilization of the Nitrogen and Phosphorus of Round and Liver of Beef, J. Nutrition **9**: 677 (June) 1935.

3. Atwater, W. O., and Bryant, A. P.: The Chemical Composition of American Food Materials, Bulletin 28, revised edition, United States Department of Agriculture, Office of Experiment Stations, 1906.

of visible fat as very lean, lean, medium fat, fat and very fat. These analyses show a wide variation in the chemical composition of different kinds and cuts of meats

The analyses summarized by Atwater and Bryant include all the fat found on the respective cuts, whereas in practice much of this fat is trimmed off by the butcher, usually more is removed in the kitchen, and any distinct layers of fat which remain on the meat when it is served at the table are likely to be left uneaten—or at least to be less completely eaten than is the lean portion of the meat. For this reason the composition of the cuts is apt to show a much higher fuel value than is in practice available to the consumer.

The percentage composition of 19 samples of sausage and sausage meats analyzed by Tobey [4] was reported as moisture 24 to 52 per cent, ash 1.27 to 3.42 per cent and fat 27.5 to 62.6 per cent; obviously the meat protein is the difference between the sum of the foregoing figures and 100. Cereal was present in 7 samples, and sulfur dioxide was present in 1 sample; the added cereal was not declared on the label of the packages.

Livers of beef, calf and hog were analyzed by Pawick and Hoagland.[5] They found the average percentage composition to be as follows: Beef liver—moisture 70, protein (N $\times$ 6.25) 20, fat 3, carbohydrate (calculated as dextrose) 3.5 and phosphorus 0.4. Calf liver—moisture 70, protein (N $\times$ 6.25) 20, fat 5, carbohydrate (calculated as dextrose) 1.6 and phosphorus 0.4. Hog liver—moisture 73, protein (N $\times$ 6.25) 20, fat 5, carbohydrate 0.2 and phosphorus 0.4.

MEAT EXTRACTS

The characteristic flavor of meat is due in a large measure to a group of nitrogenous compounds known as extractives. Among the extractives creatine is the most conspicuous, constituting about 0.25 per cent of the fresh weight of lean meat and being ordinarily the most abundant organic substance of meat extract.[6] Ever since the days of Liebig the chemical composition of meat extracts has been studied by numerous investigators. The purine bases hypoxanthine, xanthine and adenine, together with salt and other ash constituents, are the chief components of meat extract.

Meat extract was defined by the United States Joint Standards Committee in 1907 as follows: ". . . the product obtained by extracting fresh meat with boiling water, and concentrating the liquid portion by evaporation after the removal of fat . . . contains not less than 75 per cent of total solids,

4. Tobey, E. R.: Sausage and Sausage Meat, Official Inspections Bulletin 159, University of Maine, College of Agriculture, Agricultural Experiment Station, 1936, p. 11.
5. Pawick and Hoagland, cited by Winton, A. L., and Winton, K. B.: The Structure and Composition of Foods, New York, John Wiley & Sons, Inc., 1937, vol. 3, p. 311.
6. Sherman, H. C.: Food Products, ed. 2, New York, The Macmillan Company, 1930, p. 230.

of which not over 27 per cent is ash, and not over 12 per cent is sodium chloride (calculated from the total chlorine present), not over 0.6 per cent is fat, and not less than 8 per cent is nitrogen. The nitrogenous compounds contain not less than 40 per cent of meat bases, and not less than 10 per cent of creatine and creatinine."[7]

IRON CONTENT

In general, all meats are good sources of iron. Liver, heart and tongue are among the meats richest in this mineral. Although not all the total iron in foodstuffs is available to the body, as Sherman, Elvehjem and Hart[8] and Shackleton and McCance[9] have shown the amount of ionogenic iron in meat is great enough to warrant classifying meats as excellent sources of this dietary factor.

As a source of iron liver has long held a position of preeminence. Liver is also valuable for other constituents. A diet rich in liver was first used for the treatment of pernicious anemia by Minot and Murphy.[10] Pernicious anemia may be regarded, in a sense, as a deficiency disease. In the absence of some principle present in liver, the bone marrow is unable to produce its normal quota of erythrocytes. The value of liver is dependent on at least two factors, its inorganic iron content and a complex polypeptide isolated by Cohn, Minot, Olles and Satten.[11] The essential substance in liver preparations therapeutically active against pernicious anemia is not known. Jacobson and Subbarow[12] suggested that the therapeutic activity of liver extract may depend on the presence of a number of chemically distinct substances.

VITAMIN CONTENT

Aside from liver meats have relatively little vitamin A. What is present is found in the fat; the amounts present depending on the proportion of fat in the cut, the rate of fattening and the ration of the animal before slaughter.[13] It is generally agreed that the liver contains nearly all the vitamin A present in the animal body. A hundred gram portion of liver may be expected to contain as much as 20,000 U. S. P. units of vitamin A.

---

7. Cited by Winton, A. L., and Winton, K. B.: The Structure and Composition of Foods, New York, John Wiley & Sons, Inc., 1937, vol. 3, p. 391.
8. Sherman, H. C.; Elvehjem, C. A., and Hart, E. B.: Further Studies on the Availability of Iron in Biological Material, J. Biol. Chem. **107**: 383 (Nov.) 1934.
9. Shackleton, L., and McCance, R. A.: The Ionizable Iron in Foods, Biochem. J. **30**: 582 (April) 1936.
10. Minot, G. R., and Murphy, W. P.: A Diet Rich in Liver in the Treatment of Pernicious Anemia, J. A. M. A. **89**: 759 (Sept. 3) 1927.
11. Cohn, Minot, Olles and Satten, cited by Vaughn, J. M.: The Liver Treatment of Anemias: A Critical Review, Quart. J. Med. **23**:213, 1930.
12. Jacobson, B. M., and Subbarow, Y.: Studies of the Principle in Liver Effective in Pernicious Anemia: Therapeutic Activity of Its Multiple Factors, J. Clin. Investigation **16**: 573, 1937.
13. Guilbert, H. R., and Hart, G. H.: Storage of Vitamin A in Cattle, J. Nutrition **8**: 25 (July) 1934.

Holmes and co-workers[14] determined the vitamin A content of 45 beef, hog, calf and lamb livers, procured in the open market, by the antimony trichloride colorimetric method. In addition, biologic assays (U. S. P. method) were made. They found the following average vitamin A values for raw liver, expressed as Lovibond units and U. S. P. units per gram:

Kind of Liver	Number of Samples	Lovibond Units Per Gm.	Number of Samples	U. S. P. Units Per Gm.
Beef	11	252	3	302
Hog	13	182	4	278
Calf	11	533	2	1,062
Lamb	10	235	2	904

It would seem from these data that there is wide variation in the vitamin A content of the four types of liver and that calf liver is superior to beef, hog and lamb liver as a source of vitamin A.

The vitamin B_1 content of meats has been reported[15] as follows (all figures are expressed as international units of vitamin B_1 per gram of dry tissue): Beef heart, 10; beef kidney, 5; beef liver, 4; beef round, 3; beef tongue, 3; lamb liver, 4; lamb leg, 4; veal hindquarter, 4.5; veal liver, 1.7; pork ham, 11; smoked ham *A*, 11; pork ham *B*, 20; pork loin *A*, 13; pork loin *B*, 20; pork heart, 8; pork liver, 5.3 and pork kidney, 8.

Arnold and Elvehjem further reported that there is little destruction of B_1 during broiling or ordinary frying but that long cooking processes like roasting or stewing destroy 50 per cent and long frying destroys 40 per cent of the vitamin B_1 content of veal chops.

According to Mickelsen, Waisman and Elvehjem[15] lean pork is one of the best sources of vitamin B_1. They report that different samples of pork have varied in vitamin B_1 from 10 to 26 international units per gram of dried tissue. Since most of these tissues contain approximately 70 per cent moisture, this means that there are between 3 and 8 international units in each gram of fresh ham. Even after the pork hams have been processed commercially, they are still good sources of vitamin B_1. Smoked and boiled ham as well as a commercial brand of ham prepared for immediate serving contained from 8.5 to 12 international units per gram on the dry basis. Elvehjem has

14. Holmes, A. D.; Lupp, F., and Satterfield, G. H.: Beef, Hog, Calf, and Lamb Livers as Sources of Vitamin A, Food Research **1**: 443 (Sept.-Oct.) 1936.

15. Arnold, A. A., and Elvehjem, C. A.: Studies on the Vitamin B_1 Requirements of Growing Rats, J. Nutrition **15**: 429 (April) 1938. Mickelsen, O., Waisman, H. A., and Elvehjem, C. A.: Recent Studies on the Vitamin Content of Meats and Meat Products. J. Am. Dietet. A **15**: 529, Aug.-Sept., 1939.

calculated that one fried pork chop, weighing about 25 grams after drying, would supply the total daily requirement of vitamin B_1, or about 300 international units.

Stefansson[16] reported that the vitamin C content of diets composed almost exclusively of meat is attributable to the traces of vitamin C in the blood. Vitamin C also is present in liver. Scurvy can be prevented with reasonable certainty by liberal consumption of fresh raw liver. Cooked meats and liver, however, can hardly be rated as a source of vitamin C because of the small amounts eaten under ordinary circumstances.

The vitamin D present in the animal body is largely located in the liver. Devaney and Munsell[17] concluded from a study of the vitamin D content of calf, beef, lamb and hog livers, that liver may be considered a significant source of vitamin D. They reported the following values, expressed as international (U. S. P.) units per gram of raw liver: Beef, 0.47; hog, 0.44; calf, 0.095, and lamb, 0.17.

In 1931 Day[18] determined the vitamin G (riboflavin) content of the livers of both beef and veal, using the rat growth method. He reported that fresh liver, whether beef, veal or pork, is the equivalent of many samples of dried yeast, according to unitage given by Daniel and Munsell,[19] and that on the basis of dry weight it is apparently the richest known natural food source of this vitamin.

Utilizing the same method he later determined the vitamin G (riboflavin) content of meats and reported[20] the following amounts, expressed as micrograms per gram of fresh, uncooked meats: Beef brisket, 1.9; lamb chops, 2.8; bacon, 0.9; cured ham, 2.0; fresh ham, 3.0 and pork livers, 23. The decidedly lower content of riboflavin in bacon is readily explained on the basis of the high fat content of this pork product.

PROTEIN CONTENT

Meat has long been considered a particularly desirable component of the adult diet because of its content of protein of high biologic value.[21] The biologic value of a protein as the term was applied originally by Thomas[22] referred to the utilization by the body of the products of protein digestion. It was

16. Stefansson, V.: Meat Diet: Blood as an Antiscorbutic Factor, Science **84**: 227 (Sept. 4) 1936.
17. Devaney, G. M., and Munsell, H. E.: Vitiamin D Content of Calf, Beef, Lamb and Hog Liver, J. Home Econ. **27**: 24, 1935.
18. Day, P. G.: Vitamin G in Beef and Veal, J. Home Econ. **23**: 657, 1931.
19. Daniel, E. P., and Munsell, H. E.: The Vitamin Content of Foods, Miscellaneous Publication 275, United States Department of Agriculture, Bureau of Home Economics, June 1937.
20. Darby, W. J., and Day, P. L.: The Riboflavin Content of Meats, J. Nutrition **16**: 204 (Sept.) 1938.
21. Mitchell, H. H., and Beadles, J. R.: The Protein Value in Nutrition of Beef Liver, Beef Heart and Beef Kidney, J. Biol. Chem. **71**: 429 (Jan.) 1927.
22. Thomas, K., cited by Mitchell, H. H.: Biologic Value of Proteins, J. Biol. Chem. **58**: 873 (Jan.) 1924.

expressed as the percentage of the absorbed nitrogen which was retained by the body for repair or for the construction of nitrogenous tissue. Mitchell's [23] method of measuring the biologic value of a protein is based on data on nitrogen balance obtained under definite experimental conditions and involves direct determinations of the amount of nitrogen in the feces and in the urine and indirect determinations of the fraction of the fecal nitrogen or urinary nitrogen or both that is of dietary origin. The biologic value of a protein is taken as the percentage of the absorbed nitrogen (nitrogen intake minus fecal nitrogen or urinary nitrogen or both that is of dietary origin) that is not eliminated in the urine or feces. Using this method, Mitchell [24] has determined the biologic values of many foodstuffs. The average biologic values of the proteins of beef liver, heart and kidney were found to be 77, 74 and 77 per cent, respectively; and for pork and beef muscle meat 74 and 69 per cent, respectively. Glandular organs were found to have higher biologic values than muscle tissue.[25]

Moulton [26] has shown that when meat is subjected to temperatures over 120 C. the biologic value is appreciably affected. However, temperatures of normal cooking processes do not impair the digestibility and biologic value of the proteins of meat. Neither do the temperatures used in processing canned meats adversely affect the nutritive value of meat proteins.

Effect of Cooking

Because meat is usually eaten after cooking, it is important to discuss the effect of cooking on its composition. Chemically speaking, cooking involves coagulation of protein and loss of water, fat and other substances. One hundred grams of uncooked bacon on being broiled loses about 30 Gm. of water and 33 Gm. of fat, leaving a crisp product containing about 9.5 Gm. of protein and 27 Gm. of fat. This will yield about 281 calories, or a little more than 50 calories per strip.

The effect of cooking on the composition of meat was extensively studied by Grindley and his associates.[27] They reported that during the pan broiling of beef no great loss of solids is sustained, whereas during boiling from 3 to 20 per cent of

---

23. Mitchell, H. H.: A Note on the Quantitative Method of Measuring the Nutritive Value of Proteins, Biochem. J. **22**: 1323, 1928. Mitchell, H. H.; Burrough, W., and Beadles, J. R.: The Significance and Accuracy of Biological Values of Proteins Computed from Nitrogen Metabolism Data, J. Nutrition **11**: 257 (March) 1936.

24. Mitchell, H. H., and Beadles, J. R.: The Nutritive Value of the Proteins of Nuts in Comparison with the Nutritive Value of Beef Proteins, J. Nutrition **14**: 597 (Dec.) 1937.

25. Seegers, W. H., and Mattill, H. A.: Nutritive Value of Animal Tissues in Growth, Reproduction and Lactation: The Nutritive Value of Beef Heart, Kidney, Round and Liver After Heating and After Alcoholic Extraction, J. Nutrition **10**: 271 (Sept.) 1935.

26. Moulton, R. C.: Nutritive Qualities of Meats, Canner **80**: 103, 1935.

27. Grindley, McCormack and Porter, cited by Winton, A. L., and Winton, K. B.: The Structure and Composition of Foods, New York, John Wiley & Sons, Inc., 1937, vol. 3, p. 38.

the total solids may be removed in the broth. The loss of water is greater the leaner the meat, the smaller the piece and the longer the time of cooking. They also reported that beef cooked in water gives up to the broth 3 to 13 per cent of the nitrogenous matter, 1 to 37 per cent of the fat and 20 to 67 per cent of the ash. During frying it gives up to the fat used for frying 2 per cent of the nitrogenous matter and 3 per cent of the ash; on the other hand, it gains twice as much fat as was present before cooking. During roasting 0.2 to 4 per cent of the nitrogenous matter, 4 to 57 per cent of the fat and 2 to 27 per cent of the ash goes into the drippings.

The chemical composition of cooked meat varies greatly. According to Chatfield,[28] the composition of cooked beef is the most variable and that of lamb and pork is almost as variable as that of beef; cooked veal is more nearly uniform. Most meat from which the visible fat has been removed contains about 30 per cent protein and 5 per cent fat. Cooked bacon, beef tongue and beef and pork tenderloin contain more fat.[29]

The effect of cooking on the thiamin and riboflavin values of meat has not been thoroughly studied as yet.

The Place of Meat and Meat Extract in the Diet

Meat enhances the meal and makes other foodstuffs, which alone may be uninviting, more acceptable. The flavor of properly cooked meat is such that it stimulates the digestive processes. Meat extracts cause a profuse secretion of gastric juice in animals, as was shown first in Pavlov's laboratory and more recently by Lim, McCarthy and Ivy.[30] Meat extractives are thought to be of value as a gastric stimulant in man. After acute illnesses there is commonly a depression of gastric secretion; in such instances meat extracts, by stimulating the mucosa to an increased flow of hydrochloric acid, may aid in restoring the gastric juices to a normal level. Boon[31] carried out a series of experiments on medical students in order to establish the action of meat extracts and related substances on the gastric mucosa. He reported that meat extracts stimulate the flow of gastric juice and promote prompt emptying of the stomach. Liebig originally believed that the extracts of meat contained the most nourishing portion of the muscle tissue. This has been shown to be entirely fallacious, although the idea is brought up again from time to time by persons unversed in the modern knowledge of nutrition.

---

28. Chatfield, Charlotte: Cooked Meats and Poultry Classified by Chemical Composition, J. Am. Dietet. A. **13**: 312 (Nov.) 1937.
29. Hanna, M. I.: Analysis of Cooked Meats Deprived of Visible Fat, J. Am. Dietet. A. **9**: 188 (Sept.) 1933.
30. Lim, R. K. S.; McCarthy, J. E., and Ivy, A. C.: Contributions to the Physiology of Gastric Secretion: Attempt to Prove That the Humoral Mechanism Is Concerned in Gastric Secretion by Blood Transfusion and Cross Circulation, Am. J. Physiol. **74**: 616 (Nov.) 1925.
31. Boon, W. R.: The Action of Meat Extracts and Related Substances as Gastric Stimulants in Man, Brit. M. J. **2**: 412 (Aug. 28) 1937.

Meat protein is usually digested rapidly and shows a high percentage of absorption from the digestive tract, the average coefficient of digestibility being about the same for the protein of meat, milk and egg, namely, from 97 to 98 per cent.

The digestibility of the fat of meat is influenced by the amount eaten and by its mechanical condition, i. e., whether it was eaten in large or small masses. Under favorable circumstances 95 per cent or more of the fat of meat is digested and utilized.

Considered on the basis of its content of protein and fat or of its appeal to the appetite, meat is an excellent article of food. From a physiologic standpoint there can be no objection to the inclusion of moderate amounts of meat in the daily diet. The Eskimo of Greenland, who lives entirely on a carnivorous diet, exhibits no increased tendency to vascular and renal disease.[32] There is no evidence that meat in fairly generous amounts is harmful to a normal individual providing it does not replace other essential foods.

From an economic point of view meat is much more costly than other protein foods, and when it appears in too large a quantity in the diet smaller amounts of vegetables, fruits and dairy products are likely to be purchased.

Sanitary Control of Meat

All meat slaughtered in plants which sell their products in interstate commerce is subject to the Federal Meat Inspection Act (Statute 34, page 674, June 30, 1906). The purpose of the Federal Meat Inspection Act is (*a*) to insure detection and destruction of diseased and unfit meat, (*b*) to require that the preparation and handling of food composed wholly or in part of meat be conducted in a clean and sanitary manner, (*c*) to prevent the use of harmful substances in meat foods, (*d*) to require the application of the marks of inspection to inspected products and (*e*) to prevent false and deceptive labeling or marking or misleading statements in connection with meat food.

Federal meat inspectors especially trained for this work examine all animals and label all meats with the stamp "U. S. INSP'D & P'S'D." Canned meat products sold in interstate commerce also are inspected, and the statement "U. S. Inspected and Passed by the Department of Agriculture" appears on the label. These legends tell the consumer that the product was prepared under sanitary conditions supervised by a federal inspector.

Aside from the sanitary character of the meat supply, which is of real importance to health, the trade also recognizes differences in quality or grade depending on the texture and palatability of the meat, factors which are considerably influenced

32. Thomas, W. A.: Health of a Carnivorous Race: A Study of the Eskimo, J. A. M. A. 88:1559 (May 14) 1927.

by the age, nutritive condition and other characteristics of the animal. The following grade names are used:

Grade	Beef, Veal, Lamb, Mutton	Pork	Sausage
First	Prime	No. 1	U.S. No. 1
Second	Choice	No. 2	
Third	Good	No. 3	
Fourth	Medium	No. 4	
Fifth	Plain or Common	No 5	

The grade stamp runs like a ribbon from shoulder to legs of the animal, so that each cut is marked.

About 65 per cent of the meat consumed in this country is federally inspected; the remaining 35 per cent is subject to such local regulations as there are. Farmers and retail dealers under certain conditions are exempt from the Federal Meat Act. Congress, in passing the statute, specifically made the exception in their case. They simply use a certificate showing their right of exemption under the law, and their meat may go on its way to another state. There is urgent need for adequate state and municipal inspection to supplement federal inspection in order to ensure the wholesomeness of all meat killed and dressed by the local butcher, by the farmer from whom he buys his meats or by the local packing house which trades only within state borders.

Under the Federal Meat Inspection Act no label may be used until it has the approval of the Department of Agriculture. The use of words descriptive of meat products has been strictly defined by the Department of Agriculture, and packers are required to use these words in the meaning of the department.[33]

This rigid federal inspection of interstate products has greatly decreased the chance of food poisoning from meat and meat products. At present, however, there are no practical methods of inspection for trichinous meat. McNaught and Anderson[34] concluded that the consumer must assume the responsibility of preventing trichinosis by thoroughly cooking fresh pork. For poultry products there is available to manufacturing plants an inspection service of the Agricultural Marketing Service of the United States Department of Agriculture.

Preservation of Meat

Meats are preserved by drying, salting, smoking, immersion in salt solutions, freezing, quick freezing and canning.

Recently there have been developed methods of "tenderizing" hams, so that it is possible to bake or otherwise cook the ham without subjecting it to preliminary boiling. Different packers seem to have their own methods of performing this

33. Service and Regulatory Announcements, Food and Drug No. 2, fifth revision, United States Department of Agriculture, Food and Drug Administration, November 1936.

34. McNaught, J. B., and Anderson, E. V.: The Incidence of Trichinosis in San Francisco, J. A. M. A. 107: 1446 (Oct. 31) 1936.

process, and they have been loath to provide details. One method is to inject by way of an artery, shortly after the hog has been slaughtered, a curing solution which may or may not contain a proteolytic enzyme. These solutions may contain sodium chloride, sugar (either sucrose or dextrose or both) potassium nitrate or a small amount of potassium nitrite as well as a proteolytic enzyme. The curing solution softens the connective tissue of the blood vessels, thus decreasing the time of cooking, preserves the color and increases the moisture content. After the meat has been subjected to the tenderizing curing solution, it may be smoked under controlled conditions of temperature, a process which partially cooks the meat. The controlled conditions of curing are considered solely responsible by some firms for the tendering process.

There are many kinds of hams, the type depending largely on the type of curing process and the methods of smoking used. The flavors are due partly to the curing solution and partly to the wood used in smoking. But the flavor of such hams as Smithfield Ham is said to be also due to the character of the food with which the hog has been supplied before slaughter. The older curing processes require a much longer time but give to hams a flavor of high quality. Such products require longer cooking than hams cured by the newer, tender-quick process.

It has been reported of all curing methods used that the aging of hams for thirty days after cure permits further equalization of the salt content, making it more uniform in cured products.[35]

A method of treating cured meats to preserve them during storage and to prevent oxidation of fat consists of dusting the meat or wrapper with an antioxidant material, such as pulverized oats. There is a patent describing this process (see section II, page 31, for a description of this process).

Within recent years the quick freezing of meat has received considerable impetus. In this process, the freezing usually takes place as soon after slaughtering as possible at a temperature below — 17 degrees C.

Corned beef is beef that has been cured for several weeks in brine that may contain several ingredients other than salt, such as sweetening agents and preservatives. The name apparently has nothing to do with the cereal corn of today but is derived from the former method of dry preserving with grains of salt, or "corns," to use the Anglo-Saxon word.

Summary

Meat is a wholesome component of the usual diet. Although the composition of meat varies with the proportion of muscle, connective tissue and fat tissue, in general meat may be considered an excellent source of protein of high biologic value.

35. Newton, R. C.; Piskur, M. M.; Ramsbottom, J. M.; Robinson, H. E., and McClean, B. B.: Review of the Literature on Meat for 1936, Food Research 2: 581, 1937.

Meat is also a good source of iron, since a large percentage of its total iron is available for formation of hemoglobin. Liver is particularly rich in iron.

Meats vary greatly in vitamin content, glandular organs being much richer than muscle meats. All the vitamin A of animals is stored in the liver; hence liver is an especially good source of this vitamin. Some meats are excellent sources of vitamin B_1 (thiamin) and vitamin G (riboflavin); liver is particularly rich in these vitamins. Some vitamin A is found in the fat tissue of meats, although fat tissue cannot be relied on as a source of this vitamin. Vitamin D, if present, is in the liver where it occurs in small amounts (15 to 45 international units per 100 grams).

Meat may be used in fairly generous amounts if income warrants and plenty of protective foods (milk, fruits and vegetables) guarantee an adequate diet. But it is an expensive food and in low cost diets if too much is spent for meat, too little will be spent for the other foods such as fresh fruits and vegetables.

The sanitary control of fresh and canned meat sold in interstate commerce is under the jurisdiction of the Bureau of Animal Industry of the United States Department of Agriculture. This service assures high quality meat and freedom from contamination and disease for those meats on which appears the descriptive legend, "U. S. Inspected and Passed."

The listed products of the following firms stand accepted:

American Kitchen Products Company, New York.

STEERO BRAND BOUILLON CUBES, a mixture of concentrated meat extract, concentrated vegetable extract, salt and beef fat, flavored with celery seed and pimento and an extract of fresh celery, parsley and leeks.

Analysis (submitted by manufacturer).—Moisture 6.8%, total solids 93.2%, ash 68.2%, sodium chloride (NaCl) 62.5%, fat (ether extract) 1.6%, nitrogen 3.5%, nitrogenous[36] substances estimated as protein (N × 6.25) 21.9%, sucrose and reducing sugars none, creatinine 1.4%, creatine 0.6%, phosphorus (P) 0.36%.

Calories.—1.0 per gram; 28 per ounce.

Boston Food Products Company, Boston.

PRUDENCE BRAND BEEF LOAF, PORK ADDED, WITH GRAVY, canned meat loaf prepared from federal inspected chopped beef and pork, cracker meal, beef extract, flour, seasoning (sodium chloride, chopped onion, white pepper) and potassium nitrate.

Analysis (submitted by manufacturer).—Moisture 71.9%, total solids 28.1%, ash 2.3%, sodium chloride (NaCl) 1.3%, fat (ether extract) 8.1%, protein (N × 6.25) 12.8%, crude fiber 0.1%, carbohydrates other than crude fiber (by difference) 4.8%.

Calories.—1.5 per gram; 43 per ounce.

PRUDENCE BRAND BEEF STEW, canned stew containing cooked diced federal inspected beef, sliced potatoes and carrots, peas, sliced onions, salt and pepper.

Analysis (submitted by manufacturer).—Moisture 81.1%, total solids 18.9%, ash 1.6%, fat (ether extract) 1.2%, protein (N × 6.25) 8.9%, crude fiber 0.3%, starch (acid hydrolysis method) 4.0%, carbohydrates other than crude fiber (by difference) 6.9%.

Calories.—1.0 per gram; 28 per ounce.

36. Only a portion of the nitrogenous substances exists as protein.

PRUDENCE BRAND LAMB STEW, canned stew containing cooked diced federal inspected lamb, sliced potatoes and carrots, peas, sliced onions, salt and pepper.

Analysis (submitted by manufacturer).—Moisture 78.7%, total solids 21.3%, ash 1.5%, fat (ether extract) 4.5%, protein (N × 6.25) 6.8%, starch (acid hydrolysis method) 4.7%, crude fiber 0.4%, carbohydrates other than crude fiber (by difference) 7.5%.

Calories — 1.0 per gram; 28 per ounce.

PRUDENCE BRAND READY TO BROWN CORNED BEEF HASH, canned corned beef hash prepared from federal inspected beef, cured, cooked and chopped, and chopped potatoes, seasoned with salt and pepper.

Analysis (submitted by manufacturer).—Moisture 70.5%, total solids 29.5%, ash 2.1%, fat (ether extract) 1.7%, protein (N × 6.25) 10.0%, starch (acid hydrolysis method) 6.8%, crude fiber 0.5%, carbohydrates other than crude fiber (by difference) 15.2%.

Calories.—1.2 per gram; 34 per ounce.

PRUDENCE BRAND ROAST BEEF HASH, a canned mixture of cooked potatoes, roasted beef, roasted beef juices, salt and pepper.

Analysis (submitted by manufacturer).—Moisture 70.0%, total solids 30.0%, ash 2.4%, fat (ether extract) 6.4%, protein (N × 6.25) 9.5%, crude fiber 0.3%, carbohydrates other than crude fiber (by difference) 11.4%.

Calories.—1.41 per gram; 40 per ounce.

Bovril, Ltd., London, England, product distributed by Bovril of America, Inc., Camden, N. J.

BOVRIL, concentrated beef bouillon, a viscous mixture of beef extract, hydrolyzed beef protein, yeast extract and beef powder, seasoned with salt, cayenne and white pepper, celery seed and caramel.

Analysis (submitted by manufacturer).—Moisture 39.1%, total solids 60.9%, ash 18.5%, sodium chloride (NaCl) 13.6%, total nitrogen 6.2%, nitrogenous substances[37] estimated as protein (N × 6.25) 38.8%, insoluble nitrogen 1.2%, creatin 1.4%, fat (ether extract) 0.2%, carbohydrates (by difference) 3.4%.

Calories.—1.7 per gram; 48 per ounce.

H. J. Heinz Company, Pittsburgh.

HEINZ BRAND CONSOMME SOUP, canned clear consomme prepared from lean beef, calves' feet, celery, carrots, onions, added concentrated beef extract, salt, pepper and spices.

Analysis (submitted by manufacturer).—Moisture 95.0%, total solids 5.0%, ash 1.6%, sodium chloride (NaCl) 1.4%, fat (ether extract) 0.02%, protein (N × 6.25) 3.3%, carbohydrates (by difference) 0.1%.

Calories.—0.1 per gram; 3 per ounce.

George A. Hormel & Company, Austin, Minn.

HORMEL BRAND CORNED BEEF HASH, canned corned beef hash consisting of federal inspected beef, cured, chopped, cooked and ground; potatoes diced and partially cooked, and ground onions, seasoned with salt, sugar and pepper.

Analysis (submitted by manufacturer).—Moisture 68.3%, total solids 31.7%, ash 2.1%, fat (ether extract) 10.6%, protein (N × 6.25) 10.1%, crude fiber 0.1%, carbohydrates other than crude fiber (by difference) 8.8%.

Calories.—1.7 per gram; 48 per ounce.

HORMEL BRAND CHICKEN SOUP WITH RICE, a canned mixture of chicken broth, rice, salt, sugar and water extract of carrots, celery, onions and peppers.

Analysis (submitted by manufacturer).—Moisture 93.9%, total solids 6.1%, ash 1.2%, fat (ether extract) 1.7%, protein (N × 6.25) 2.1%, crude fiber trace, carbohydrates (by difference) 1.1%.

Calories.—0.3 per gram; 9 per ounce.

---

37. The nitrogen determined includes that of ammonium salts, purine and pyrimidine bases, mono and diamino acids and proteins.

HORMEL BRAND VEGETABLE SOUP, a canned mixture of beef broth, canned tomatoes, potatoes, carrots, celery, navy beans, canned corn, rice, barley, canned string beans, lentils, canned peas, canned pimientos, canned okra, kidney beans, salt and onion extract.

Analysis (submitted by manufacturer).—Moisture 92%, total solids 8%, ash 1.2%. fat (ether extract) 1.4%, protein (N × 6.25) 1.3%, crude fiber 0.3%, carbohydrates other than crude fiber (by difference) 3.8%.

Calories—0.3 per gram; 9 per ounce

International Products Corporation, New York.

TOREX, concentrated beef bouillon, a semifluid mixture of beef extract, salt, vegetable extract, starch. powdered white pepper and onion, packed in block tin tubes.

Analysis (submitted by manufacturer)—Moisture 45.9%, total solids 54.1%, ash 28.8%, sodium chloride (NaCl) 23.6%, total nitrogen 3 2%, fat (ether extract) 0.4%, reducing sugars before inversion as dextrose none, starch 2 1%, creatine 2.70%, creatinine 1 35%, acidity (cc tenth-normal alkali per gram) 3.54 cc., phosphorus (P_2O_5) 1 98%, potassium (K) 2.17%.

Calories.—0.12 per gram; 3.4 per ounce.

Oscar Mayer & Company, Chicago.

OSCAR MAYER'S BRAND SLICED BACON, federal inspected bacon, dry cured, smoked and sliced.

Analysis (submitted by manufacturer).—Moisture 14.1%, total solids 85.9%, ash 4.0%, fat (ether extract) 71 7%, protein (N × 6.25) 7.3%.

Calories.—6.7 per gram; 190 per ounce.

FISH AND SEA FOODS

Fish and sea foods, like meat and meat products, are essentially protein foods. Fish protein contains all of the essential amino acids, without which the body cannot replace its wear and tear and either develop or function normally. In addition to protein, fish and sea foods may be the source of other components of nutritional value, notably minerals and some vitamins.

Composition and Nutritional Value

PROTEIN, MOISTURE AND FAT CONTENT

The composition and food value of fish vary among different species of fish and also among different fish of the same species. The main fluctuations in the composition of fish flesh occur in the percentage of moisture and the percentage of fat; as the fat content increases the water content decreases, and vice versa. The percentage of protein does not fluctuate widely; neither does the percentage of ash. Individual variation of fish of the same species is due to the greater success of some fish in securing their food in the struggle for existence, the proximity at the time of spawning and the locality where the fish are caught.

The first report of extensive analyses of fish is that of Atwater,[38] published in 1888. His investigations covered fifty-two American species.

38. Atwater, W. O.: The Chemical Composition and Nutritive Values of Food Fishes and Aquatic Invertebrates, Report of the United States Commissioner of Fish and Fisheries for 1888, 1892, p. 679.

In the case of many fish there is a seasonal variation in their composition and food value, which is generally in the direction of increase in the fat content from spring to fall. This was brought out by Clark and Almy,[39] who found considerable variation in many species (bluefish, butterfish, carp, sucker, and weakfish) from spring to fall in their work on twenty species of Atlantic food fishes. Weakfish from the same school caught at the same time showed a wide variation in fat content (4 composite samples of 3 fish each showed fat percentages of 1.35, 2.47, 4.88, and 8.03). More recently, Clark and Clough[40] reported that the percentage of fat in a group of bluefish caught in May was 1.54, while that in a group of bluefish caught in September was 8.10. In the case of butterfish, a group caught in May contained on an average 5.96 per cent of fat, and another group, caught in October, contained on an average 13.5 per cent.

Shostrom, Clough and Clark[41] made an extensive study of the composition of the Pacific coast salmon and steelhead trout as influenced by species and by locality where caught. They reported that the percentage of protein did not vary greatly between individual fish, different species, or fish from different localities, the extreme variation being from 17.2 to 22.8 per cent protein. The salt-free ash also was uniform in composition. However, the fat content varied greatly between individual fish, between species, between localities and between years, the extreme variation being from 2.65 to 27.26 per cent. The moisture content also varied greatly but inversely with the fat—that is, as the fat increased the moisture decreased.

The composition of accepted brands of canned fish and sea food products is shown in table 1. The vitamin content of each accepted product (if reported) is given in the description of the product at the end of this section.

MINERAL CONTENT

The mineral content of fish varies with that of its environment. Salt water fish contain more ash and more iodine than fresh water fish.

Ocean water is known to contain slight traces of the less common elements, such as manganese, arsenic, copper, lead and zinc. These elements have been found to be normal constituents of the tissues of marine forms. Hiltner and Wichmann[42] determined the occurrence of zinc and also of copper

39. Clark, E. D., and Almy, L. H.: A Chemical Study of the Food Fishes: The Analysis of Twenty Common Food Fishes with Especial Reference to a Seasonal Variation in Composition, J. Biol. Chem. **33**: 483, 1918.

40. Clark, E. D., and Clough, R. W.: Chemical Composition of Fish and Shell Fish: Nutritive Value of Fish and Shell Fish, Document 1,000, United States Department of Commerce, Bureau of Fisheries, 1926.

41. Shostrom, O. E.; Clough, R. W., and Clark, E. D.: A Chemical Study of Canned Salmon, J. Indust. & Engin. Chem. **16**: 283 (March) 1924.

42. Hiltner, R. S., and Wichmann, H. J.: Zinc in Oysters, J. Biol. Chem. **38**: 205, 1919.

in oysters from various localities on the Atlantic seaboard. They concluded that zinc and copper are present universally in oysters grown in Atlantic water and that these elements can be retained in quantities far in excess of functional requirements, especially in oysters grown in water polluted with metallurgic and factory wastes. Bodansky [43] investigated the zinc content of the fairly large number of marine animals of the Gulf of Mexico. Fourteen species of fish were analyzed,

TABLE 1.—*Composition of Accepted Brands of Canned Fish and Sea Foods (Analyses Submitted by Manufacturers)*

Sea Foods*	Number of Brands	Moisture, %	Total Solids, %	Ash, %	Sodium Chloride (NaCl), %	Fat,† %	Protein (N × 6.25), %	Crude Fiber, %	Carbohydrates,‡ %	Iodine (I), Mg. per 100 Gm.	Calories per Gm.
Crab......	1	77.2	22.8	2.9	§	0.5	19.5	§	None	0.07	0.83
Fish product‖	1	54.2	45.8	0.8	§	28.1	4.7	0.3	11.9	§	3.19
Salmon											
Blueback, Sockeye.., Red......	3	68.8	31.2	2.9	1.1	7.6	20.7¶	§	None	0.01 to 0.06	1.51
Chinook, King...	2	68.2	31.8	2.6	1.2	9.7	19.5¶	§	None	0.01 to 0.06	1.65
Sardine....	17	60.4	39.6	2.8	1.3	18.4	17.5	0.1	0.8	0.6	2.38
Tuna......	2	53.7 to 55.1	44.9 to 46.3	2.3 to 2.9	1.4 to 1.5	17.9 to 18.8	24.6 to 25.4	0.0 to 0.02	None to 0.1	0.03 to 0.1	2.70 to 2.66

* For descriptions of individual products see the list of accepted sea foods at the end of this section.
† Ether extract.
‡ Other than crude fiber (by difference).
§ Not reported by the manufacturer.
‖ The name of the product is "Olav's A and D Vitamin Pâté."
¶ By difference.

and zinc was found in all. The amount varied between 0.002 mg. per hundred grams in the mullet to 1.49 mg. per hundred grams in the catfish.

Parks and Rose [44] analyzed the copper, iron, and manganese content of twenty species of fresh water and salt water fish. They reported the content of copper in both the fresh and the salt water fish to average 2.5 mg. per kilogram of moist material. Salt water fish contain about 12 per cent more iron

43. Bodansky, M.: Biochemical Studies on Marine Organisms: II. The Occurrence of Zinc, J. Biol. Chem. 44:399, 1920.
44. Parks, T. B., and Rose, E. R.: The Copper, Iron, and Manganese Content of Fish, J. Nutrition 6:95 (Jan.) 1933.

than fresh water fish, and dark flesh contained approximately 75 per cent more iron than light flesh. Analyses show that fish contain less iron than meats[8]

The iodine content of fish is of interest; in table 2 are data on this point from Tressler and Wells[45] Marine fish and shellfish contain a higher percentage of iodine than common foods; fresh water fish as a class are much less rich in iodine than salt water fish.

Although salmon is less rich in iodine than some other sea foods, the large amounts in which it is consumed may make it a factor of some importance in prophylaxis against goiter Jarvis, Clough and Clark[46] reported that considerable variation occurs between species and even more variation within the same species from different districts. They stated that the iodine values of red salmon (sockeye, blueback), in milligrams per hundred grams, range from 0.01 to 0.06; of king (Chinook and spring), from 0.02 to 0.05; of coho (medium, red, silver), from 0.01 to 0.04; of pink, from 0.01 to 0.05, and of chum, from 0.02 to 0.04. Average values are as follows:

TABLE 2.—*Iodine Content of Various Fish* *

Product	Source	Mg per 100 Gm
Oysters	Atlantic Ocean	0.12
Crabs, meat flakes	Atlantic Ocean	0 02
Lobster	Atlantic Ocean	0 14
Shrimp	Atlantic Ocean	0 04
Bluefish	Atlantic Ocean	0 03
Cod	Atlantic Ocean	0 02
Haddock	Atlantic Ocean	0 03
Pompano	Atlantic Ocean	0 01
Scup	Atlantic Ocean	0.08
Spot	Atlantic Ocean	0.06
Weakfish	Atlantic Ocean	0.02
Winter flounder	Atlantic Ocean	0 02
Salmon, canned	Pacific Ocean	0 02
Sardines, canned	California	0 04
	Maine	0 06
Cod, salted	Atlantic Ocean	0 07
Mackerel, salted	Atlantic Ocean	0 04
Herring, smoked	Atlantic Ocean	0 05

* Data taken from Tressler and Wells.[45]

Salmon	Mg. Iodine Per 100 Gm.
Red (sockeye, blueback)	0.04
King (Chinook, spring)	0.04
Coho (medium, red, silver)	0.02
Pink (humpback)	0.03
Chum	0.02

45. Tressler, D. K., and Wells, A. W.: Iodine Content of Sea Foods, Document 967, United States Department of Commerce, Bureau of Fisheries, 1924.

46. Jarvis, N. D.; Clough, R. W., and Clark, E. D.: Salmon in a Diet for Prophylaxis of Goiter, J. A. M. A. 86: 1339 (May 1) 1926

In general they found that as the salmon approaches the spawning stage the iodine content of the flesh is decreased, apparently passing into the milt and roe, since these contain much more iodine than the flesh. The iodine content of canned salmon is approximately the same as that of fresh salmon produced from the same area. Although there are marine animals having a higher iodine content (lobster and oysters), canned salmon, on account of its cheapness and availability, is a particularly suitable source of iodine and could well be included in the diet for that reason.

VITAMIN CONTENT

Very little vitamin A is present in the flesh of lean fish, but the body oils of some fish yield a considerable amount. However, the greatest store of this vitamin is concentrated in the liver. Canned salmon, which has been studied more thoroughly than most fish, has been found to be a fairly rich source of vitamin A. Devoney and Putney [47] report the vitamin A content of various salmon as follows: red, 250 to 400 international (U. S. P.) units per hundred grams; chinook, 400 to 800; pink, 100, and calico chem, 25 to 30.

Vitamin B_1 (thiamin) is present in fish. Baker and Wright,[48] using the bradycardia method, reported the following values, expressed as micrograms per gram (3.3 micrograms is equivalent to 1 international unit): rock cod, 1.2; rock whiting, 0.9; fried halibut, 1.8; tinned sardines, 0.9; shrimps, 0.9. Whipple [49] reported that oysters have 150 Sherman units per hundred grams (37 international units; 74 micrograms). Vitamin G (riboflavin) is present in fish in small quantities.

Goldberger and Wheeler [50] found canned salmon effective in preventing pellagra hence it contains some nicotinic acid.

Vitamin C has been found to be present, but only in small quantities, in the oyster.

Vitamin D is found in very small amounts in oysters and in large amounts in canned salmon.[51]

Preservation of Fish

Fish, being buoyed up by the water in which they swim, do not need as firm a structure as that required by land animals. Consequently, the flesh is more loosely put together, with less connective tissue, which renders the fish more susceptible to damage by roughness in handling and to changes leading to

47. Devoney, G. M., and Putney, L. K.: The Vitamin A and D Content of Canned Salmon, J. Home Econ. **27**: 658, 1935.

48. Baker, A. Z., and Wright, M. D.: The Vitamin B_1 Content of Foods, Biochem. J. **29**: 1802, 1935.

49. Whipple, D. V.: Vitamins A, D, and B in Oysters: Effect of Cooking upon Vitamins A and B, J. Nutrition **9**: 163, 1935.

50. Goldberger, J., and Wheeler, G. A.: A Study of the Pellagra-Preventive Action of Canned Salmon, Pub. Health Rep. **44**: 2769 (Nov. 15) 1929.

51. Daniel, E. P., and Munsell, H. E.: Vitamin Content of Foods, Miscellaneous Publication 275, United States Department of Agriculture, 1937.

decomposition. It is imperative, therefore, that fish should be handled with great care and that they should be canned or otherwise preserved as quickly as possible, in order that destruction may be kept at a minimum.

Fresh fish are preserved for short periods by being packed in ice; but this is only a temporary means, and the quality of such products will be lowered after a few days. The chief means of preserving fish for a longer period are freezing, canning, salting, smoking and drying. Sometimes two or more of these methods are combined. Canning is the most important, economically, of all methods of preserving fish in the United States, and salmon is the most important sea food canned. There are five species of salmon in the United States which are valuable for canning: red, or sockeye; pink; chum, or keta; medium red coho, or silverside, and king, or Chinook. In recent years steelhead salmon also have been canned in limited quantities.[52] In 1937 the salmon pack in the United States amounted to 7,526,197 cases of 48 cans each containing 1 pound (227 Gm.). A detailed description of the commercial handling of salmon has been given by Cobb.[53] The loss of nutritive value during the processing of salmon is very slight, and as the cooking has already been done, the product can be eaten cold as a salad if so desired.

Sardines as canned on the coast of Maine are young or small herrings, while those canned in California are known as pilchards (Clupae caerulieus, blue sardines). Pilchard sardines are caught in the open sea off the coast of California during definite seasons, four months after and three months before spawning. The sardines are delivered fresh to the cannery each day.

The fish are pumped or hoisted from the boats into receiving tanks. Clean salt water is pumped over the fish and kept circulating during the short period of storage (two hours). They are sluiced into small boxes, in which the heads and tails are cut off and the entrails are extracted by machine. They are conveyed by water into rinsing tanks, where scales, blood and excessive slime are washed off with salt water. When the wash water becomes clear, the fish are conveyed on belts to the packers, who pack then into cans. The fish in cans are passed through cooking apparatus on perforated iron grills. The grill travels with the cans spread right side up for eight minutes. The cans are automatically turned over on the belt so that the contents rest on the grill, which permits the moisture, blood or other materials cooked out of the fish to escape and fall into a trap below. This process is repeated four

52. Figures for production of canned salmon in the United States in 1937 are as follows: red, or sockeye, 2,168,528; pink, 3,947,271; chum, or keta, 786,397; medium red coho, or silverside, 236,708; king, or chinook, 369,725; steelhead, 17,568 cans each containing 1 pound.

53. Cobb, J. N.: Pacific Salmon Fisheries, Document 1092, United States Department of Commerce, Bureau of Fisheries.

times during the cooking. The fish in this process become solid and firm, take on an excellent flavor and do not come in contact with air. The fish are discharged on a belt conveyor. Olive oil, tomato sauce, salt and olive oil, or curry sauce, salt and olive oil may be added to each can. The cans are sealed while hot, which produces a low pressure or "vacuum" after sealing. The sealed cans are placed in baskets and processed at a temperature and for a sufficient time to insure satisfactory keeping qualities; they are then cooled, labeled and boxed.

Summary

Fish and sea food are considered particularly desirable components of the usual diet chiefly because of their content of protein of high biologic value. Canned salmon is a significant source of vitamin D. Small amounts of vitamin A and vitamin B_1 also are commonly found in sea foods. Salt water fish and sea foods contain iodine in greater amounts than common foods. The inclusion of fish containing iodine in the diet is a factor of some importance in prophylaxis against goiter.

Modern methods of preserving and transporting food have made fish available the year around to persons living in the interior as well as to those who live along the seacoasts.

The listed products of the following firms stand accepted:

K. Hovden Company, Monterey, Calif.

HOVDEN'S BRAND CALIFORNIA SARDINES, peeled and boneless, packed in olive oil.

HOVDEN'S BRAND CALIFORNIA SARDINES, French style, packed in olive oil.

HOVDEN'S BRAND CALIFORNIA SARDINES, garnished with slices of pickle, carrot and pimiento, packed in olive oil.

HOVDEN'S BRAND CALIFORNIA SARDINES, smoked and boneless filets, packed in olive oil.

HOVDEN'S BRAND SARDINES, steam grilled, packed in olive oil and tomato sauce.

PORTOLA BRAND FILET OF PILCHARD SARDINES, packed in olive oil.

PORTOLA BRAND PILCHARD SARDINES, boneless and peeled, packed in olive oil.

PORTOLA BRAND PILCHARD SARDINES, French style, packed in olive oil.

PORTOLA BRAND PILCHARD SARDINES, garnished with slices of pickle, carrot and pimiento, packed in olive oil.

PORTOLA BRAND PILCHARD SARDINES, steam grilled, packed in tomato sauce and olive oil.

PORTOLA BRAND PILCHARD SARDINES, steam grilled, packed in curry sauce and olive oil.

PORTOLA BRAND CALIFORNIA TUNA, light meat of yellowfin tuna with added salt, refined cottonseed oil and sliced sour pickle.

Products distributed by Pacific Packers Association, Monterey, Calif.

PREFET BRAND CALIFORNIA SARDINES, packed in olive oil and mustard sauce.

PREFET BRAND CALIFORNIA SARDINES, packed in olive oil and tomato sauce.

PREFET BRAND FILET OF SARDINES, smoked and boneless, packed in olive oil.

PREFET BRAND PILCHARD SARDINES, boneless and peeled, packed in olive oil.

PREFET BRAND SARDINES, French style, packed in olive oil.

PREFET BRAND SARDINES, garnished with slices of pickle, carrots and pimiento, packed in olive oil.

Libby, McNeill & Libby, Chicago.

LIBBY'S BRAND BLUEBACK SALMON, designated by the manufacturer as fancy grade.

LIBBY'S BRAND CHINOOK ALASKA SALMON. King salmon may be used also.

LIBBY'S BRAND CHINOOK SALMON, designated by the manufacturer as fancy grade. King salmon may be used also.

LIBBY'S BRAND RED ALASKA SALMON, designated by the manufacturer as fancy grade.

LIBBY'S BRAND SOCKEYE ALASKA SALMON.

Pacific Packers Association, Monterey, Calif. *See* K. Hovden Company.

Thor Cannery, Fredrikstad, Norway.

OLAV'S A AND D VITAMIN PÂTÉ, a canned cooked mixture of ground cod livers, potatoes, eggs, salt, mace, nutmeg and white pepper.

Vitamins.—The vitamin potency of the product varies considerably; therefore the values recorded are average figures based on three assays reported in and prior to 1937. Olav's A and D Vitamin Pâté contains 11,000 U. S. P units of vitamin A and 1,400 U. S. P units of vitamin D per ounce

Van Camp Sea Food Company, Inc., Terminal Island, Calif.

CHICKEN OF THE SEA BRAND TUNA, canned light meat of tuna packed in cottonseed oil with salt.

WHITE STAR BRAND TUNA, same as Chicken of the Sea Brand.

Product distributed by White Star Canning Co., Los Angeles.

CHICKEN OF THE SEA BRAND TUNA.

WHITE STAR BRAND TUNA.

The following firm distributes under its own label a product purchased from a manufacturer of accepted sea food products now privileged to use the Seal of Acceptance. The labels and advertising conform to the Rules and Decisions of the Council.

Alaska Salmon Company, San Francisco.

FRIGID ZONE BRAND CRAB, canned cooked meat of Alaska Crab.

SECTION VIII

Milk and Milk Products Other than Butter

Definition and Composition.—The word milk unqualified refers to whole cow's milk. The composition of milk varies somewhat with breed and with the period of lactation, the nutritional state and other factors pertaining to the individual cow. The average composition of market milk is 87.5 per cent water, 4.9 per cent lactose, 3.5 per cent fat, 3.4 per cent protein and 0.7 per cent ash. Mineral elements are found in the following approximate amounts: calcium 0.118 per cent, magnesium 0.012 per cent, potassium 0.143 per cent, sodium 0.051 per cent, phosphorus 0.093 per cent, chlorine 0.106 per cent and sulfur 0.034 per cent. The energy value is approximately 65 calories for each 100 Gm., or 635 calories to the quart (946 cc.).

Most states regulate by law the minimum fat content of milk offered for sale, and many prescribe minimum percentages of total solids or solids not fat. The legal minimum fat content established by most communities is 3.5 per cent. In most states the minimum amount of "solids not fat" allowed is 8.5 per cent. The tendency of many dairies is to sell milk of a fat content no higher than the law requires. The minimum standard then becomes the maximum. It is customary in milk plants to combine milks of different composition to obtain a mixture of standard content.

Nutritional Significance of Milk.—Milk has come to be regarded as the sine qua non of an adequate diet. It is a rich source of calcium, whereas all other foods by contrast are poor sources. A child requires at least 1 Gm. of calcium daily, and milk contains approximately 1.2 Gm. of calcium to the quart. The average diet for the child for the entire day when milk is excluded supplies less than one third of the required amount of calcium. The average adult should have at least 0.5 Gm. of calcium daily in order to maintain calcium equilibrium. This amount may be obtained from a pint of milk or from a good diet that includes a full glass of milk. Milk is also a rich source of phosphorus, containing 0.9 Gm. of this mineral to the quart. Phosphorus, however, is not as apt to be lacking in the American diet as calcium. These minerals are present in readily assimilable forms and occur together in good proportions; thus adequacy of these two dietary essentials is assured when calcium needs are mainly met by milk.

Milk protein is of high biologic quality, owing to the presence in relative abundance of all the essential amino acids.

Though the percentage of protein in milk is not high, the amounts of milk recommended for children contribute significantly to the fulfilment of their total protein need. A quart of milk contains enough protein to supply the average daily protein requirement of a child under the age of 3 years and one third of the protein requirement of the older child.

The principal proteins of milk are casein and lactalbumin, which occur in the proportion of approximately 6 to 1. Because these proteins contain 15.9 and 15.4 per cent of nitrogen, respectively, the appropriate factor for converting percentage of nitrogen to percentage of milk protein is 6.38. When milk clots, casein forms the curd while lactalbumin is found in the whey.

The fat of milk is highly emulsified, consisting of particles from 4 to 6 microns in diameter. Fat globules of this size coalesce, as shown by the appearance of cream in the top of an ordinary milk bottle. Since emulsification is a preliminary step in the process of digestion, it is believed that the fat found in milk is readily digested. The fat of milk is important as a carrier of the fat-soluble vitamin A and to some extent of vitamin D.

Milk is an excellent source of vitamin A and contributes an appreciable proportion of the requirement for this vitamin. The standard allowance of vitamin A for an adult has been tentatively set at about 4,000 U. S. P. units daily and the minimum allowance at 3,000 units or less. A quart of milk supplies from 1,000 to 2,000 units, depending on the feed of the cow. Thus for the older child and adult a quart of milk may be expected to supply from one third to two thirds of the minimum allowance of vitamin A. The vitamin A requirement of the infant is not known, but the criterion of clinical experience indicates that the milk diet of the healthy infant supplies a satisfactory intake of vitamin A.

The vitamin A of milk is derived from the carotene of the green feed, which is converted in part to vitamin A in the body of the cow. The degree to which the ingested carotene is converted to vitamin A varies with the breed. The milk fat of some breeds contains a small fraction of vitamin A and a large proportion of carotene, as indicated by its deep color, while that of other breeds may be of lighter color but of equal potency because it contains a larger proportion of vitamin A, which is colorless, and less carotene. Therefore the vitamin A potency of milk depends on the amount of fresh green feed available to the cow and on the breed.

The vitamin D in milk is derived from that of sun-cured hays and from that developed in the cow's body on exposure to sunshine and therefore is subject to seasonal variation, the content rising in the summer, when ultraviolet radiation is the greatest. Under normal feeding conditions the vitamin D content of milk varies from 5 to 10 U. S. P. units to the

quart during the winter and from 15 to 40 U. S. P. units to the quart during the summer. The vitamin D of milk even in the maximum amounts found is thus of little significance compared with the human need. Special methods for increasing the antirachitic potency of milk by feeding rations rich in vitamin D and by irradiation of milk with ultraviolet rays and by the addition of vitamin D preparations to the milk are discussed under the heading "Milks Fortified with Vitamin D."

The vitamin B_1 content of milk ranges from 50 to 225 international units to the quart. It cannot be increased by improving diets considered adequate for the cow. Since the amount of vitamin B_1 in milk is small, diluted milk formulas for babies frequently supply an inadequate amount of this vitamin. The requirement of the older child or of the adult has been tentatively stated as about 13 international units per hundred calories.

Vitamin G (riboflavin) is present in milk in relatively greater amounts than vitamin B_1. The concentration of vitamin G in milk may be raised somewhat by feeding the cow rich sources of this material, but the increases are not great. The daily adult allowance for vitamin G has been estimated at 600 Sherman-Bourquin units. A quart of milk supplies from 400 to 750 Sherman-Bourquin units, and the need of the infant or young child is readily met by this amount. Each glass of milk consumed by the older child or adult supplies approximately one fourth of his requirement for vitamin G. Thus milk is an important source of this vitamin.

The vitamin C content of milk is small and variable, and since vitamin C is susceptible to destruction by oxidation on standing or heating, milk cannot be considered a significant source of this vitamin.

Milk contains relatively small amounts of iron and copper. In milk as it comes from the cow the iron content may be as low as 0.02 mg. or less for each 100 Gm. Commercial milks, however, contain slightly more because of contact of the milk with iron containers during processing. The amount of copper in milk as secreted by the cow varies from about 0.12 to 0.18 mg. to the quart, with an average of 0.15 mg. A considerable increase may result from contact with the exposed copper of cooling coils and utensils during processing. The iron and copper of milk, even in the maximum amounts found, are of little significance compared with the adult need; they may be more important to the infant, although the amount of iron is not sufficient to furnish the infant's needs.

Lactose, the sugar present in milk, is a good food and contributes to the energy requirement, but evidence is lacking that it has nutritional significance different from that of any other sugar. Lactose has been held to promote the absorption of calcium from the intestine and therefore to enhance the value of milk as a source of calcium in the diet. Quantitative evidence in support of this relationship for the human being and

of its practical importance if it exists is lacking. Additional information on lactose is given in section VI, entitled "Preparations Used in the Feeding of Infants."

Sanitary Control of Milk.—Milk is an excellent medium for many dangerous bacteria as well as an excellent food for man. Disease germs may enter the milk directly from an ailing cow, or they may be introduced by insects or by the fingers or mouth spray of persons having to do with the collection or transportation of milk.

Once in the milk, some of the disease germs may multiply enormously. Extensive epidemics of typhoid, scarlatina, diphtheria, septic sore throat and other diseases are sometimes caused by contamination of milk supplies. In numerous cases tuberculosis and undulant fever have been caused by raw milk.

Even when great care is used in overseeing the health of the cattle and of the milkers and in maintaining the cleanliness of the dairy, there remain many possibilities of contamination A milker may become overnight an unwitting carrier of some disease germ in his nose or throat; a typhoid carrier may be unknowingly employed in a most carefully conducted dairy.

Since disease germs are readily destroyed by well established methods of pasteurization, all milk for direct human consumption or for use in ice cream, cheese or other milk products should be pasteurized according to officially approved methods. After pasteurization the milk should be so stored and protected that it will not be contaminated.

Pasteurization of Milk.—The pasteurization of milk is a public health measure. The public should demand pasteurized milk for drinking and the use of pasteurized milk in milk products. The dairy trade should universally adopt pasteurization in the interest of public health.

There is no cogent evidence that pasteurized milk is significantly inferior nutritionally to raw milk.

Most communities of the United States have laws requiring the pasteurization of milk. Two general methods are used. The most widely used in this country is the holding process; the other is the flash process, a method employed to a greater extent today than formerly. In the holding process milk is held at a temperature of about 62 C. for thirty minutes, and in the flash process it is heated momentarily to about 74 C. With either method, subsequent rapid cooling is necessary to prevent the growth of bacteria that remain in the milk. Pasteurization destroys pathogenic bacteria and attenuates the lactic acid-forming bacteria usually found in milk. It also decreases the vitamin C content of the milk, but ordinarily one does not rely on milk for this vitamin. Pasteurization has a negligible effect on the curd tension of milk.

A rapid method for testing the adequacy of the pasteurization process has long been sought. Recently the phosphatase

method[1] has been studied for this purpose, and favorable reports indicate its usefulness. Phosphatase, an enzyme always present in raw milk, is inactivated by efficient pasteurization. This enzyme is readily detected by the property it possesses of being able under certain conditions to hydrolyze phosphoric esters. Thus a relatively simple chemical method can be used to check the thoroughness of the pasteurization of milk.

The Council on Foods does not consider for acceptance ordinary fluid milk of individual dairies. Obviously the most important feature of such milk is its sanitary quality, which is controlled by local regulations. The Council does consider individual milk products for which special health claims are advanced, and the Seal of Acceptance is granted to such products as conform to the Rules and Decisions of the Council. In the following sections such milk products will be discussed.

HOMOGENIZED MILK

Homogenized milk is milk that has been mechanically treated in such a manner as to alter its physical properties, with particular reference to the condition and appearance of the fat globules.

Homogenization is produced commercially by forcing milk through minute openings under high pressure. This procedure breaks up the large fat globules and suspends them uniformly throughout the milk. The smaller fat globules then become coated with a protein membrane which prevents coalescence and stabilizes the suspension, thus preventing the formation of a layer of cream.

Within limits the degree of fat dispersion increases with increased temperature of the milk when homogenized. The usual commercial practice is to carry out the process of homogenization at or near the temperature of pasteurization and usually immediately after pasteurization, while the milk is still hot. Practical experience has shown that a minimum pressure of from 2,500 to 3,000 pounds to the square inch is necessary to produce a stable nonseparating product. Newer methods have been developed which produce a suitable product at pressures as low as 500 pounds to the square inch. When homogenization is carried out under these conditions the great majority of the fat globules are less than 2 microns in diameter, whereas in unhomogenized milk relatively few of the fat globules are less than 3 microns in diameter and more than half of the fat is in globules more than 4 microns in diameter. Homogenization increases the surface area of the fat globules of milk from 4 to 6 times.

Homogenization lowers the curd tension[2] to a degree that depends on the heat and pressure employed. A processing

1. Kay, H. D., and Neave, F. K.: Dairy Ind. **2**: 5 (Jan.) 1937. Standard Methods for the Examination of Dairy Products, ed. 7, New York, American Public Health Association, 1939.

2. The Nutritional Significance of the Curd Tension of Milk, Council on Foods, J. A. M. A. **108**: 2040 (June 12) 1937.

temperature of 74 C. has been found to be more effective in lowering the tension of the curd than a temperature of 49 or 62 C., but probably the most effective method involves preheating to 82 C. followed by cooling to 38 C. and homogenization at the latter temperature. Increased pressure to 2,000 or 3,000 pounds to the square inch increases the effect on curd tension. The fact that the milk has been homogenized, however, is no assurance that it has a low curd tension unless the initial curd tension and conditions of processing are known to be suitable.

Allowable Claims for Soft Curd Milk.—Soft curd claims are not recognized by the Council on Foods unless it can be shown that the product in question has a curd tension of 20 grams or less as measured by the Hill [3] or Miller [4] method, and evidence is presented to show that the milk and machinery being used provide a product having uniformly a curd tension below this level. Tests should be run at frequent intervals to control the processing as far as the preparation of milk with a low curd tension is concerned.

Homogenized milk compares favorably with ordinary pasteurized milk in palatability. The dispersion of fat is an advantage in serving large numbers of persons in an institution, since each person is assured an equitable portion of cream. There is no satisfactory evidence that the diminished size of the fat globules is a factor in improving digestion of fat even in infants.

Homogenized milks which yield soft curds are well tolerated and well utilized by infants, children and older persons. Milk that has a low curd tension, as determined by appropriate laboratory methods, leaves the stomach more quickly than milk that does not have this property. Such digestion as takes place in the stomach is more quickly accomplished when the curd is soft. The evidence is meager, however, that any soft curd milks are "better digested" or more completely digested than ordinary boiled milk.

Homogenized milk may be fortified with vitamin D by the same processes as are used with regular milk. Since the vitamin D properties of milk are associated with the fat content, it is evident that if the fat of milk is evenly distributed and cannot separate, the vitamin D of the milk will likewise be well dispersed throughout the milk. An even distribution of vitamin D throughout the milk is advantageous because each consumer will obtain vitamin D in proportion to the amount of milk ingested. Homogenized vitamin D milks that stand accepted by the Council are listed under headings indicating the various kinds of vitamin D fortification.

---

3. Hill, R. L.: The Physical Curd Character of Milk and Its Relationship to the Digestibility and Food Values of Milk for Infants, Utah Agricultural Experiment Station, Bull. 207, 1928.

4. Miller, D.: The Determination of Curd Tension by the Use of Hydrochloric Acid-Pepsin Coagulant, J. Dairy Sci. **18**: 259, 1935.

EVAPORATED MILK

The term evaporated milk is applied to unsweetened condensed milk obtained by the evaporation of a considerable portion of the water from milk. The first successful attempt to preserve milk by evaporation was made by Nicholas Appert, who in 1810 evaporated milk in a water bath to about half its original volume and then strained, cooled and bottled the milk. It remained sweet for two years; however, the cream rose and formed a separate layer. In a later experiment Appert added to the milk a small amount of beaten egg yolk and observed no separation of the cream.

Modern commercial methods of evaporating in vacuum are a great improvement over Appert's open pan treatment and yield a far more palatable product. Homogenization is now included in the process to prevent the formation of a layer of cream. Milk is adjusted to a fat content of approximately 3.7 per cent; if necessary the hydrogen ion concentration is adjusted, and the milk is then kept at a temperature of from 85 to 100 C. for ten minutes, concentrated to slightly less than half, or about 45 per cent, of its former volume in a vacuum pan at approximately 54 to 60 C. and homogenized. The concentrated homogenized milk is cooled, sealed in cans and then subjected to a temperature of approximately 115 C. for at least fifteen minutes. This heat processing sterilizes the contents of the sealed can. Evaporated milk is marketed in cans commonly of two sizes; the larger contains 13 fluidounces, (384 cc.), or 14.5 ounces (411 Gm.) avoirdupois, and the smaller 5.4 fluidounces (160 cc.), or 6 ounces (170 Gm.) avoirdupois.

At some stage of the preparation, the composition of the product is standardized to conform to the requirements of the Food and Drug Administration. According to these regulations, evaporated milk contains not less than 7.8 per cent of milk fat or less than 25.5 per cent of total milk solids. The sum of the milk fat and the total milk solids must not be less than 33.7 Gm. for each 100 Gm. of evaporated milk.

The accepted evaporated milks contain moisture from 72.7 to 74.5 per cent, total solids from 25.5 to 27.3 per cent, ash from 1.4 to 1.6 per cent, fat from 7.8 to 8.2 per cent, protein (N $\times$ 6.38) from 6.4 to 8.5 per cent and lactose from 8.5 to 10.5 per cent. Their caloric value is 1.4 calories to the gram, or 40 calories to the ounce. For ordinary use, evaporated milk is diluted with an equal volume of water. The reconstituted milk prepared in this way approximates fresh whole milk in composition and caloric value.

The vitamin content of reconstituted evaporated milk is slightly inferior to that of fresh milk, but fortunately the greatest losses occur in those vitamins which milk is not depended on to furnish. There is little or no vitamin C in evaporated milk, and there is a loss of from 20 to 25 per cent or more in the amount of vitamin B_1. There is also a

slight and probably negligible loss of vitamin A during evaporation. Vitamin G (riboflavin), however, appears to escape destruction, although the evidence on this point is meager. The heat processing involved in the preparation of evaporated milk denatures the milk proteins somewhat and changes their allergenic quality. Many persons who are sensitive to fresh milk can tolerate evaporated milk.

The homogenization and heat treatment together assure a soft curd character in evaporated milk. The advantage of this quality is mentioned under the heading "Homogenized Milk." This characteristic, however, prevents one from using evaporated milk for the preparation of rennet desserts.

Evaporated milk suitably diluted is widely used for infant feeding. Its uniform composition, the sterility of the contents of the unopened can and its soft curd quality render it particularly adapted to this purpose when the usual vitamin supplements are given. Because evaporated milk costs less than

Approximate Composition, Evaporated and Whole Milk

	Evaporated Milk plus Equal Volume of Water, Percentage	Fresh Whole Milk, Percentage
Moisture	86.5	87.5
Ash	0.8	0.7
Fat	4.0	3.5
Protein	3.7	3.4
Lactose	5.0	4.9
Calories per fluidounce	21	19.5

pasteurized whole milk, it is an economical milk to buy when there is little money to spend for food. When properly diluted it can be used in practically all the ways in which pasteurized whole milk is used.

Evaporated milk may be fortified with vitamin D by any acceptable method to the extent that the reconstituted milk will have approximately the same vitamin D properties as an equal volume of fresh milk similarly fortified. The label of evaporated vitamin D milk must show the unitage and source of vitamin D.

At present, evaporated milk is fortified with vitamin D either by the addition of a vitamin D concentrate or by irradiation of the milk. Evaporated vitamin D milks that stand accepted by the Council are listed under the headings indicating various kinds of vitamin D fortification.

SWEETENED CONDENSED MILK

Sweetened condensed milk is the form in which milk was first preserved on a commercial scale. The industry was initiated in Connecticut by the efforts of Gail Borden during the middle of the last century and was given considerable impetus by the Civil War, when there was a special demand for a preserved milk.

Sweetened condensed milk is defined as "the product resulting from the evaporation of a considerable portion of the water from milk to which sugar and/or dextrose has been added. It contains not less than 28 per cent of total milk solids, and not less than 8 per cent of milk fat."

Accepted sweetened condensed milks are prepared by heating milk of standard composition to 85 C., adding sucrose, holding at from 85 to 90 C. for fifteen minutes and concentrating in vacuum pans at 55 C. to less than one third of the original volume. The product is cooled to 18 C. and sealed in cans. Since sugar is a preservative, the product is not subjected to further heat treatment.

Accepted sweetened condensed milks contain moisture from 26 to 27 per cent, total solids from 73 to 74 per cent, ash from 1.7 to 1.8 per cent, fat from 8 to 8.1 per cent, protein ($N \times 6.38$) from 7.6 to 8.2 per cent, sucrose from 44 to 45 per cent, lactose from 11 to 11.9 per cent and carbohydrates (by difference) from 56.7 to 54.9 per cent. The caloric value is from 3.2 to 3.3 calories to the gram, or from 91 to 94 calories to the ounce.

While no extensive data are available about the vitamin potency of sweetened condensed milk, such milk may be considered a good source of vitamin G (riboflavin).

Sweetened condensed milk is used in cooking and candy making. While it was formerly considerably used in infant feeding the amount of sugar, in comparison with the amounts of protein, fat and minerals, is high, and the milk is considered unsuitable as a regular food for infants for any considerable period, although the ease with which it is tolerated makes it useful as a temporary food. It is readily digested by the newborn infant in dilutions of 1 to 10 and 1 to 8 and is useful for feeding prematurely born infants when human milk is lacking. The very ease with which this product is tolerated by infants constitutes a potential danger; the mother may be tempted to continue its use over too long a period.

Although the heat treatment involved in its preparation is comparatively mild, condensed milk has been found by experiment to yield soft curds in the stomach.

DRIED MILK

The preservation of milk in the dry form is by no means new. Marco Polo described a method of drying milk used by the Tartars in 1298. The commercial development of dried milk in America was inaugurated about 1870.

The terms applied on the market to the various types of dried milk are intended to indicate the fat content of the dry milk, the nature of the milk from which the product was made and the drying process used in the manufacture. Dried milk is marketed either as powdered whole milk or as a partially to an almost completely defatted product. Prior to drying, whole milk is adjusted to a fat content of approxi-

mately 3.5 per cent. The federal standard requires 26 per cent of milk fat in dried milk. The skimmed milk products are prepared from milk containing from 1.5 to 0.1 per cent fat. The moisture limit of both dried milk and dried skim milk is 5 per cent.

The drying may be accomplished by what is termed the spray process or by the hot roller, or drum, process. In the spray process fine streams of fluid milk, previously heat treated or pasteurized, are forced into a hot chamber through which a current of hot air is blown. Drying is almost instantaneous. In the hot roller, or drum, process the milk is permitted to flow in a thin stream on steam-heated rollers. There are two general types of drum driers, the atmospheric and the vacuum. Dried milk made by the atmospheric drum process disperses in water more slowly and less completely than dried milk made either by the spray process or by the vacuum drum process.

Because the fat of dried milk becomes rancid so easily in the presence of oxygen, it is customary to pack dried milk in an atmosphere of nitrogen for commercial distribution. Dried milks are not sterile, but they may be expected to contain a relatively small number of organisms and these nonpathogenic.

Dried whole milk contains moisture from 1.5 to 2 per cent, ash from 5.8 to 6 per cent, protein (N $\times$ 6.38) from 26 to 26.8 per cent, fat (ether extract) from 27 to 28 per cent and lactose (by difference) from 37.5 to 38 per cent. The caloric value ranges from 4.97 to 5.11 calories to the gram, or from 141 to 145 calories to the ounce.

Dried partially defatted milk contains moisture from 1.5 to 3 per cent, ash from 7 to 7.9 per cent, protein (N $\times$ 6.38) from 32 to 36.5 per cent, fat (ether extract) from 1 to 12 per cent and lactose from 46 to 51.8 per cent. The caloric value ranges from 3.25 to 3.62 calories to the gram, or from 103 to 121 calories to the ounce.

The drying of milk apparently produces little change in its nutritive properties. For spray-dried milk the loss of vitamin B_1 is approximately the same as for evaporated milk and slightly greater than for milk dried by the roller process. Except for some loss of vitamin C, the vitamins seem little affected by the processing. The treatment of milk incident to drying by the various processes results in a product that forms small curds in the stomach.

Dried whole milk is reconstituted to the equivalent of the original milk by mixing one part by weight with seven parts of water. One ounce by weight is approximately 5 packed level tablespoonfuls in volume. Dried skimmed milk is reconstituted by mixing one part by weight with approximately nine parts of water. Dried milk is used in baked products, in candy and ice cream and in prepared pancake and biscuit flours. Reconstituted dried milk not only may be used in any cookery process in which fresh fluid milk may be used but is useful for special diets and for infant feeding.

MALTED MILK

Malted milk is a product made by combining whole milk with the liquid separated from a mash of ground barley malt and wheat flour, with or without the addition of sodium chloride, sodium bicarbonate and potassium bicarbonate, in such a manner as to secure the full enzymic action of the malt extract. The malted mixture is then carefully dried. The resulting product according to federal standard must contain not less than 7.5 per cent fat and not more than 3.5 per cent moisture.

The manufacture of malted milk on a commercial scale was begun in this country in 1883. A common procedure for preparing malted milk is as follows: A mash of ground barley malt, wheat flour and water is kept warm (45 to 60 C.) until the starch is completely converted to maltose and dextrins. The mixture is then filtered, and the filtrate, partially neutralized with sodium bicarbonate, is mixed with whole milk and held at from 50 to 40 C. for several hours (two to four hours) to promote full enzymatic activity of the malt extract as specified by the federal standard. Various methods are used for drying this mixture, though usually it is first concentrated in vacuum pans and then dried in finishing pans or on drums. The dried product is ground, salt is added, and the mixture is packed.

Malted milks that stand accepted contain moisture from 2 to 3 per cent, ash from 2 to 4 per cent, fat from 6 to 9 per cent, protein from 8 to 15 per cent, fiber from none to 0.3 per cent and total carbohydrate other than crude fiber (by difference) from 70 to 82 per cent. One ounce supplies from 116 to 119 calories.

Sometimes malted milk is mixed with sugar and cocoa or chocolate. The term double malted has been applied when twice the usual quantity of barley malt is used. The addition of twice as much malt extract, however, does not assure twice as much proteolytic action. The proportion of milk solids in malted milk varies considerably with the brand. Milk solids may make up approximately 30 per cent of ordinary malted milk; double-malted milk contains proportionately less milk solids.

Malted milk provides food energy and contains biologically efficient protein. It may be considered to be a good source of vitamins B_1 and G (riboflavin) and to contain vitamin A. Double-malted milk contains less milk solids and therefore has a proportionately smaller amount of vitamin A. Malted milk is a good source of calcium and phosphorus.

Allowable Claims for Products Containing Diastatically Active Malt or Malt Extract.—Although diastatically active malt or malt extract products have starch digestive properties, they are of no significance for digesting starch or for aiding the normal processes of starch digestion. Starch digestive claims in advertising for this type of foods usually have therapeutic or medicinal

implications which lead to self-medication and are unwarranted; they promote misleading advertising.

Malted milk preparations are used for beverages, desserts and ice cream drinks. When mixed with fluid milk or ice cream malted milk is a popular food. The powder will keep indefinitely in any climate, and for this reason it is an excellent product for portage on fishing or hiking expeditions.

CHOCOLATE-FLAVORED DRINKS CONTAINING MILK

Chocolate-flavored drinks, ordinarily known as "chocolate milk," are popular because of their flavor. The Council on Foods objects to the name "chocolate milk" for the following reasons: 1. The word milk according to federal standards means whole milk. While some dairies use whole milk for their chocolated-flavored drink (in some states the law requires that only whole milk be used for this purpose), the majority of dairies use partially defatted milk, the butter fat content ranging from 0.5 to 1.5 per cent. 2. The name "chocolate milk" implies that the milk is whole milk flavored only with chocolate, whereas the flavoring base often contains cocoa as well as chocolate and in addition other ingredients. The term chocolate-flavored drink is more properly descriptive of these products.

It is a requirement of the Council that bottle caps, to be acceptable, must bear a descriptive statement listing the ingredients in the order of decreasing proportions by weight. For example, the bottle cap of an accepted chocolate-flavored drink carries the following statement: "Pasteurized, chocolate-flavored, sweetened, partially defatted milk; added tapioca and salt." The term "skimmed milk" is also satisfactory and may be even preferable to the term "partially defatted milk."

A common procedure for preparing chocolate-flavored drinks is to add a drink base, composed of sugar, cocoa or cocoa and chocolate, salt, vanilla and an emulsifying agent such as tapioca or agar, to partially defatted milk that previously has been heated to from 60 to 65 C. After the addition of the drink base the milk product is maintained for thirty minutes at from 60 to 65 C., or the temperature is increased and the product is held for a shorter period. The drink is then cooled and bottled for distribution. Only pasteurized products are acceptable to the Council.

Accepted chocolate-flavored drinks contain water from 80 to 83 per cent, carbohydrate from 12 to 16 per cent, protein 2.3 per cent, fat from 1.4 to 2 per cent and ash from 0.7 to 0.9 per cent. The caffeine and theobromine content is from 0.01 to 0.02 per cent (an 8 ounce [237 cc.] glass contains 0.5 grain [0.03 Gm.] of caffeine and theobromine). The drinks supply approximately 22 calories to the ounce.

Chocolate-flavored drinks have a slightly higher caloric value than whole milk and provide only slightly less calcium, phos-

phorus and vitamin B_1. When prepared from skimmed milk they contain significantly less vitamin A than whole milk. The vitamin A content of the chocolate-flavored milks may range from a negligible amount to slightly less than that of whole milk, depending chiefly on the amount of butter fat present.

MILK FORTIFIED WITH VITAMIN D

Only a few common foods contain vitamin D in significant quantities. In general vitamin D is obtained by direct irradiation of the skin with sunshine or with certain forms of lamps which furnish the requisite wavelengths or by the ingestion of substances such as fish liver oils and viosterol in oil or foods which have been suitably fortified.

Of all the common foods available, milk is most suitable as a carrier of added vitamin D. Vitamin D is concerned with the utilization of calcium and phosphorus, of which milk is an excellent source. At present milk is the only common food which is considered for acceptance when fortified with vitamin D. "Milk" in the present instance includes fresh pasteurized milk and in addition those milk products which are used in place of fresh pasteurized milk, such as dried whole milk, dried skimmed milk, evaporated milk and flavored whole or skimmed milk drinks containing at least 80 per cent of milk by volume.

Vitamin D properties may be imparted to milk by the direct addition of either natural or manufactured vitamin D concentrates, by irradiation of milk and by proper feeding of vitamin D preparations to cows. Milks with a vitamin D content ranging from 135 to slightly more than 400 U. S. P. units to the quart or to the reconstituted quart, in the case of the concentrated processed milks, have been accepted by the Council.

Controlled clinical tests show that irradiated milk containing 135 units to the quart usually will prevent rickets when ingested by normal full term infants in the customary quantities physicians prescribe. There is evidence also that most infants are better safeguarded when they are given amounts of vitamin D in addition to that furnished by milk containing 135 units to the quart.

Milk containing 400 units of animal source vitamin D to the quart prevents rickets in normal full term infants and promotes growth when fed in the customary quantities that are prescribed by physicians. This amount of vitamin D is usually greater than that required and thus provides a margin of safety.

Milk with at least 400 units of plant source vitamin D to the quart usually prevents rickets when fed in customary amounts and probably supplies an adequate margin of safety. The equivalence of the potency of these milks on a rat unit basis has not yet been proved, though the difference, if any, is slight.

Vitamin D milks have enhanced nutritive values for both children and adults. They aid in the proper development of bones and teeth. They are especially suitable for children who do not receive vitamin D from special sources.

To be acceptable to the Council on Foods, vitamin D milks must meet certain special requirements in addition to the usual sanitary requirements. Bottle caps or labels must contain declaration of the unitage of vitamin D in U. S. P. units and of the source of vitamin D (unless local governmental regulations prohibit such declaration), statement of pasteurization, statement of homogenization if this process has been used, designation of grade (in accordance with local health laws) and identification of distributor. The Council exacts responsibilities from both licensor, or the firm which sells the vitamin D medium, and licensee, or the dairy which distributes the finished product.

Dairies and licensors are held mutually responsible by the Council for the maintenance of uniform vitamin D potency. This potency is determined by biologic assay against a standard reference cod liver oil. Protocols of a minimum of three assays a year of each milk or milk product must be furnished to the Council on Foods as well as to the local health authorities charged with the enforcement of legislation pertaining to milk.

All advertising prepared by the licensors and distributed by the licensees must comply with the rules and regulations of the Council on Foods.

In order to have their products considered dairies must provide suitable information on the following points:

Data concerning the control of the production, inspection and sanitation of the milk by local health authorities.

Method of pasteurization. Fluid milk, to be acceptable, must be pasteurized, and the Council advocates that the dairy trade universally adopt pasteurization in the interest of public health.

Method of cleaning the milk bottle. The procedure followed must be in accord with the regulations of the local health authorities. The Council also accepts milk dispensed in single service paper containers provided they bear the information required for caps and hoods on glass bottles.

Procedure used for incorporating the vitamin D medium in the milk and assurance that this procedure is in complete accord with that specified by the licensor from whom the vitamin D medium is obtained.

The minimum percentage of butterfat of milk used.

Assurance of compliance with the requirements of the Council on Foods with regard to labeling and advertising.

Allowable Claims for Milk Fortified with Vitamin D.—In the advertising of vitamin D milk the implication should not be made that the Council favors the use of any vitamin D-fortified milk over the prescribing of other forms of vitamin D for infants or recommends the use of vitamin D milk to the exclu-

sion of an additional supply of the vitamin in some other form. The following allowable claims may be made for vitamin D milks; the units referring to U. S. P. units per quart:

1. Milks containing 135 units of vitamin D have enhanced nutritive value, especially for growing children, and usually will prevent clinical rickets when fed to normal infants in customary quantities. For milks with only 135 units there shall be no claim or intimation that an amount of vitamin D adequate for infants is being supplied.

2. Milks containing 400 units of vitamin D have enhanced nutritive value, especially for growing children, and prevent clinical rickets when fed to normal infants in customary quantities. For milk with 400 units the claim may be made that the amount of vitamin D is greater than that usually required for the prevention of rickets in normal infants and thus provides a margin of safety.

3. Milks containing 400 units of vitamin D obtained from animal sources promote growth when fed to infants in the customary amounts.

Milk Fortified with Cod Liver Oil Preparations

VITEX

In 1922 Zucker[5] described a process of extracting a vitamin D concentrate, from cod liver oil, free of fatty acids and ordinary fats. The patent covering this process was assigned to University Patents, Inc., New York, a subsidiary of Columbia University (U. S. Patent 1,678,454, July 24, 1928). Under a license granted by University Patents, Inc., the vitamin D concentrate (Vitex) is prepared from cod liver oil according to this process by the Vitex Laboratory, a subsidiary of the National Oil Products Company.

The vitamin D concentrate is supplied to dairies in the form of a "cream" emulsion that has been assayed and standardized. At the dairy this preparation is finely dispersed in milk prior to pasteurization in amounts sufficient to provide 400 U. S. P. units of vitamin D per quart.

CLO-DEE

Clo-Dee is the registered trademark of a cod liver oil concentrate manufactured under the Barthen process (U. S. patent 1,984,858, Dec. 18, 1934) by White Laboratories, Inc., Newark, N. J. The concentrate is dispensed in three mediums, each known by a trade name: Clo-Dee in concentrated milk (Clo-Dee emulsion), Clo-Dee in vegetable oil (regular Clo-Dee) and Clo-Dee in butterfat (Clo-Dee in butterfat). Each product is assayed, standardized and distributed in hermetically sealed cans.

Regular Clo-Dee and Clo-Dee in butterfat contain vitamins A and D and when used in the requisite amounts fortify milk with 2,000 U. S. P. units of vitamin A and 400 U. S. P. units of vitamin D to the quart. Clo-Dee emulsion is standardized

5. Zucker, T. F.: Proc. Soc. Exper. Biol. & Med. 19: 167, 1922.

to fortify milk with 400 U. S. P. units of vitamin D, but no claim is made for vitamin A fortification.

Dairies obtain the Clo-Dee products from the White Laboratories, Inc. The methods of adding the various concentrates to the milk to be fortified are similar. The required amount of concentrate is added to a small amount of milk and thoroughly mixed. This mixture is then added to the milk to be fortified, and the milk is pasteurized.

Milk Fortified by Irradiation

The observation that many edible food materials when exposed to ultraviolet rays are endowed with the ability to prevent or cure rickets was noted independently by Hess and by Steenbock in 1924. The patent covering the method of producing vitamin D by irradiating activatable substances with ultraviolet rays (U. S. patent 1,680,818, Aug. 14, 1928) is administered by the Wisconsin Alumni Research Foundation. To produce irradiated milk dairies must obtain a license from the foundation.

The source of ultraviolet rays for commercial irradiation of milk is a carbon arc or mercury arc in quartz. The milk is subjected to the lamp momentarily in a thin film. Commercial irradiation equipment varies greatly in size and capacity, the extremes in capacity being approximately 1,200 and 6,000 or more pounds (544 and 2,722 Kg.) of milk an hour. Excellent mechanical control over the irradiation process has been accomplished. Both the rate of flow of milk and the amount of radiant energy are recorded. When these two factors are correctly adjusted, the vitamin D potency imparted to milk is accurately controlled. By this process a potency of 135 U. S. P. units of vitamin D to the quart may be obtained. The foregoing account refers to equipment producing milk having a potency of 135 U. S. P. units of vitamin D to the quart. Recently, irradiators capable of producing a milk of 400 U. S. P. units of vitamin D to the quart have been developed and are being installed in some dairies.

The production of vitamin D in milk is almost instantaneous by the irradiation process. There is ample evidence to show that no measurable destruction of other vitamins occurs in the brief period required to activate milk with ultraviolet rays. Prolonged irradiation is destructive to vitamin A in milk or in any other food which contains it. The time required to effect appreciable destruction of vitamin A in milk is fifteen minutes or longer. Vitamins B_1 and G (riboflavin) are not always completely destroyed after several hours of irradiation.

Milk Fortified with Activated Ergosterol

IRRADIATED ERGOSTEROL

Ergosterol is a plant sterol which when irradiated with ultraviolet rays is converted to vitamin D. The preparation of irradiated ergosterol used by dairies is prepared by Standard

Brands, Inc., the licensee of the Wisconsin Alumni Research Foundation, Madison, Wis., for the production of such products when used in foods. The ergosterol is irradiated in alcohol or ether solution and is then taken up in butter oil, and the alcohol or ether removed by distillation under diminished pressure in a current of nitrogen. After standardization, the product is shipped to the Wisconsin Alumni Research Foundation, where it is reassayed, mixed with milk that has about 15 per cent cream and distributed to dairies in hermetically sealed 10 ounce (296 cc.) cans. The product is known to the dairy trade as irradiated ergosterol in homogenized milk constituents.

At the dairy the required amount of the concentrate is added to a quart of raw milk and thoroughly mixed. This mixture is then added to the raw milk to be fortified and mixed by the tank agitator. The milk is then pasteurized. Milk fortified by the addition of irradiated ergosterol contains not less than 400 U. S. P. units of vitamin D to the quart.

VIOSTEROL A. R. P. I. PROCESS

Ergosterol, a provitamin D, may be activated by low velocity electrons, and when so activated it may be used like irradiated ergosterol in the production of vitamin D milk. The method of producing vitamin D from ergosterol by low speed electrons is known as the American Research Products, Inc., process, and the resultant product is known as viosterol A. R. P. I. process. American Research Products, Inc., a subsidiary of General Mills, Inc., Minneapolis, manufactures this product under license agreement with E. I. du Pont de Nemours & Co. (U. S. patent 2,117,100, May 10, 1938).

For use in fortifying fluid milk, viosterol A. R. P. I. process is dispensed in unsweetened evaporated milk, sterilized, assayed and standardized as to U. S. P. units of vitamin D. This product is known to the dairy trade as A. R. P. I. process vitamin D concentrate. At the dairy a quantity of the concentrate sufficient to yield 400 U. S. P. units of vitamin D to the quart is emulsified with a small amount of milk, and the mixture is then added to the entire batch of milk to be fortified. The milk is then pasteurized.

Vitamin D Milk Produced by Feeding Cows Irradiated Yeast

When cows are fed irradiated yeast some of the vitamin D is transferred to the milk. Metabolized vitamin D milk, as the product is often called, is produced under the joint sponsorship of Standard Brands, Inc., and the Wisconsin Alumni Research Foundation. The irradiated dried yeast intended for use in the feeding of cows is sold by Standard Brands, Inc., to dairymen licensed by the Wisconsin Alumni Research Foundation. A feeding schedule is made part of the license agreement, and before a license is issued the dairyman must present a statement from his local health department, medical milk

commission or other official milk control body to the effect that he is responsible, in good standing and qualified to produce the milk under proper conditions.

The amount of the irradiated yeast fed to the cow is regulated to produce milk containing not less than 400 U. S. P. units of vitamin D to the quart. The amount of yeast required for each cow varies, depending on the milk output of the cow. Cows with high milk production are more efficient than those with low production in transferring the vitamin D to the milk. The yeast must be fed at least twice daily in order to obtain an even output of vitamin D in the milk, and a period of yeast feeding of from two and one-half to three weeks is required before the vitamin D output is stabilized at its maximum.

CHEESE

Cheese is the product made from the separated curd obtained by coagulating the casein of milk, skimmed milk or milk enriched with cream. The coagulation is accomplished by the use of rennet or other suitable enzyme, lactic fermentation or a combination of the two. The curd may be modified by heat, pressure, ripening ferments, special molds or suitable seasoning. The name cheese unqualified means Cheddar cheese (American cheese, American Cheddar cheese), according to the federal Food and Drug Administration.

There are many varieties of cheese. The chief varieties found in this country, listed in order of increasing hardness, are cottage, cream, Neuchâtel, Camembert, Limberger, brick, Roquefort, Cheddar, Swiss and Parmesan. Approximately two thirds of the cheese made in this country is of the Cheddar type. The chief factor in consistency is the water content, though in some types, such as cream cheese, the fat content also is important.

Cheese of all types consists mainly of coagulated casein, fat and water. Lactose is absent from most of the well ripened cheeses. The amount of fat varies with the type of cheese and method of manufacture. Some cheeses are made from whole milk and others from partially skimmed milk, and for others cream is used, or cream is added to whole milk.

In the manufacture of cheese the casein is coagulated either by lactic acid–producing organisms or by rennin, according to the type of cheese desired. For some cheeses lactic acid organisms are used for the development of flavor but coagulation is by rennin. Of the various types of cheese mentioned, all except cottage and cream cheese are ripened by special bacteria or molds. Besides the water and fat content, it is the ripening process which gives to cheese its special type characteristics.

A pound of cheese (Cheddar cheese) represents the casein and fat of a gallon (3.8 liters) of average milk. Casein is a phosphoprotein which yields all of the nutritionally essential amino acids, and milk fat is especially rich in vitamin A.

Cheese is also rich in calcium and phosphorus, since these elements in milk are largely in combination in or with the casein in the rennet process of cheese making. A hundred calory portion of cheese furnishes approximately 300 U. S. P. units of vitamin A and 40 Sherman-Bourquin units of vitamin G. Cheese is recognized as a rich source of protein, calcium and vitamin A and a good source of vitamin G.

Cheese is thus a product in which some of the nutritive values of milk have been much concentrated. When compared with most other foods of animal origin, cheese is an economical food, and when given a rational place in the meal and thoroughly chewed it is usually well digested.

The nutritional merit of cheese is so well established that individual brands of (Cheddar) cheese are not considered for acceptance by the Council on Foods. Cheese products made from (Cheddar) cheese, such as processed and compounded cheese, and packaged cream cheese are considered for acceptance by the Council.

Cream Cheese

Cream cheese is made from cream with varying amounts of fat, depending on the amount of fat desired in the finished cheese. In the manufacture of cream cheese, sweet cream, usually with 18 to 20 per cent fat, is pasteurized, homogenized and cooled to 21 C. Salt and a culture of lactic acid-producing organisms are added. After incubation at 21 C. for twenty-four hours, the product is transferred to bags, chilled and allowed to drain. It is then packed for distribution.

The composition of accepted brands of cream cheese varies within rather wide limits, especially as to water and protein content. The fat ranges from 37.4 to 45 per cent, water from 45 to 54.6 per cent and protein (N $\times$ 6.38) from 4.5 to 6 per cent; ash amounts to 1 per cent and calcium to 0.04 per cent. The number of calories ranges from 3.6 to 4.2 to the gram, or from 102 to 119 to the ounce. A hundred calory portion (25.6 Gm.) of an accepted brand of cream cheese would furnish 0.09 Gm. of calcium, 360 U. S. P. units of vitamin A and 12 Sherman-Bourquin units of vitamin G. Cream cheese is a rich source of calcium and vitamin A. Vitamin G is present in insufficient quantity to warrant a claim, and protein is present in small quantity. In order to avoid spoilage of cream cheese it is necessary to have careful processing, storage at low temperatures and early marketing.

Compounded Cheese

When cheese is melted and mixed with milk products such as cream, skimmed milk or milk there is obtained a product known as compounded cheese. An emulsifying agent is usually added. The cheese usually employed is of the American, or Cheddar, variety. The milk products employed may be dried whole or skimmed milk, cream, evaporated milk and whey,

not all these products being used in any one compounded cheese. When whey is added, as much as 30 per cent of the whey of the original milk may be returned to the cheese. The emulsifying agent usually is a mixture of disodium phosphate (Na_2HPO_4) and trisodium phosphate (Na_3PO_4), although in recent years sodium monostearosulfoacetate[6] has been used as an emulsifying agent in some compounded cheeses. Sometimes sodium citrate and citric acid are added, and it is customary to add sodium chloride. Compounded cheese is relatively soft. It is wrapped in tinfoil and distributed in cartons.

The composition of compounded cheese is approximately water 43 per cent, fat 26 per cent, protein 20 per cent, lactose 6 per cent and ash 5 per cent. Compounded cheese has a vitamin potency in proportion to the amount and kind of cheese plus the additional vitamin-carrying ingredients. The composition of each accepted product is given in the description of that product.

Process Cheese

Process cheese consists of cheese, usually of the American or Cheddar variety, which has been ground, mixed with an emulsifying agent and seasoned with salt. The resulting product is soft in contrast with the original cheese and is usually of a consistency permitting it to be spread. If the original cheeses have varying tastes, they are blended in such a way as to produce a relatively uniform flavor in the different batches of the processed product.

Accepted brands of processed cheese contain water from 39.7 to 41.1 per cent, fat from 27.4 to 30.8 per cent, protein ($N \times 6.38$) from 22.6 to 25.5 per cent, ash from 4.8 to 5.5 per cent, lactose (by difference) from 1.1 to 2.6 per cent and phosphorus from 0.28 to 0.35 per cent. The number of calories ranges from 3.6 to 3.75 per gram, or from 102 to 107 per ounce. Processed cheese has a vitamin potency in proportion to the amount and kind of cheese contained in the formula.

ICE CREAM

Ice cream is a term applied to a variety of frozen products. No federal standards exist at present for ice cream. For this reason it is impossible to state definitely the composition of commercial ice cream, as the materials used and the formula adopted vary with the manufacturer responsible. Every state, however, has a minimum standard for butterfat content, which ranges from 8 to 14 per cent. Federal specifications provide that ice cream purchased for government institutions shall have 12 per cent butterfat. Many states regulate also the percentage of total milk solids, including butterfat, which by a simple process of subtraction gives consumers the minimum legal per-

6. *See* Section II, "Fats and Oils and Their Products," page 41.

centage of milk solids not fat. The minimum legal percentage of milk solids in the states runs from 18 to 20. Some states prescribe a minimum percentage for all solids of from 30 to 35.

A high quality ice cream, according to Eckles, Combs and Macy,[7] contains from 10 to 14 per cent fat, from 14 to 15 per cent sugar, from 9 to 11 per cent milk solids not fat and approximately 0.5 per cent gelatin. The total solid content may range from 36 to 38 per cent.

The procedure for making ice cream calls for beating the "mix" to more or less fluffiness and then hardening it. During the beating process the volume of ice cream in the freezer increases because of the incorporation of air; this is technically referred to as "swell" or "overrun." The percentage of overrun is a question of density; 100 per cent overrun means ice cream of 50 per cent density, and 70 per cent overrun means ice cream of about 59 per cent density. Most ice creams have between 100 and 50 per cent overrun, though it is not unusual to find ice cream with as much as 130 per cent overrun. At present there are no federal or state regulations for the amount of overrun. The federal government in buying for its institutions specifies ice cream of not more than 100 per cent overrun, or about 50 per cent air. In other words, ice cream bought by the government must weigh at least 4½ pounds (2 Kg.) to the gallon. That figures out at 1 pound and 2 ounces (510 Gm.) to the quart, or about 9 ounces (255 Gm.) to the pint.

The purity of ice cream is under the control of local departments of health. Some of the departments require the pasteurization of all milk products in ice cream, and a few stipulate that not only the milk products but the whole mix must be pasteurized on the premises where frozen. Many limit the bacteria count of ice cream in their districts to 50,000, but only nine states have state laws regulating this count, and the limits range from 100,000 to 500,000. The maximum set by the federal government for ice cream bought for its institutions is 50,000 bacteria per cubic centimeter.

The nutritive value of ice cream depends on its density. The average composition of ice cream of not more than 100 per cent overrun (50 per cent density), is protein 4 per cent, fat 14 per cent and carbohydrate 21 per cent. An average serving (43 Gm.) of such ice cream provides about 1.7 Gm. of protein, 9 Gm. of carbohydrate, 6 Gm. of fat, 35 mg. of calcium, 34 mg. of phosphorus, 0.08 mg. of iron, 200 units of vitamin A and 96 calories.

Because of the necessity to limit the scope of products to be considered for acceptance, the Council on Foods decided in 1937 to place ice cream products on the exempted list of foods. One result of this action has been the formation of an Association of Quality Ice Cream Producers, which has established high sanitary and advertising standards for its members. The Council looks favorably on the policy of control and improvement within

7. Eckles, C. H.; Combs, W. B., and Macy, H.: Milk and Milk Products, ed. 2, New York, McGraw-Hill Book Company, 1936, p. 263.

an industry, and while it will not be possible to grant the use of the seal for the cartons and in the advertising for the products of the member firms, the Council allows the members to incorporate on their cartons and in other advertising a uniform statement (without the Seal of Acceptance) that the method of manufacture and the advertising claims are acceptable to the Council on Foods. It should be emphasized that the Council continues to consider and to pass on the nutritional claims in the advertising of classes of food products, whether or not acceptance is granted to individual brands.

FILLED MILK

The term filled milk as defined by the Federal Filled Milk Act means "any milk, cream or skimmed milk, whether or not condensed, evaporated, concentrated, powdered, dried or desiccated, to which has been added, or which has been blended or compounded with, any fat or oil other than milk fat, so that the resulting product is in imitation or semblance of milk, cream or skimmed milk whether or not condensed, evaporated, concentrated, powdered, dried or desiccated" (section 61, title 21, U. S. C. A.).

This definition does not apply to certain types of distinctive proprietary food compounds that are not readily mistaken in taste for milk or to those compounds designed for infant feeding which are shipped exclusively to physicians, druggists, hospitals and similar institutions. Nor is the definition construed to include any milk or cream from which no milk or butter fat has been extracted, whether or not it is condensed, evaporated or powdered, to which has been added any substance rich in vitamins. Nor is the definition held to prevent the addition of chocolate as a flavor to milk, cream or skimmed milk, whether or not condensed, evaporated or powdered, to which has been added or blended no fat other than milk fat.

The statute declares that "filled milk, as herein defined, is an adulterated article of food, injurious to the public health, and its sale constitutes a fraud upon the public. It shall be unlawful for any person to . . . ship or to deliver for shipment in interstate or foreign commerce, any filled milk" (section 62, title 21, U. S. C. A.). This act was adopted by Congress, March 4, 1923, and its constitutionality was validated by the Supreme Court on April 25, 1938 (*United States* v. *Carolene Products Company,* 58 S. Ct. 767). During this interval filled milk was manufactured and sold in several states in which the lower courts had ruled that the filled milk statute was unconstitutional and that filled milk is a wholesome article of food manufactured and sold according to the rules and regulations of the Federal Food and Drug Act of 1906.

Patents covering the manufacturing process of filled milk were assigned to Carnation Milk Products Company, Chicago (U. S. patents 1,193,477, Aug. 1, 1916; 1,432,632, Oct. 20, 1916; 1,432,634, June 30, 1917; 1,432,633, June 30, 1917;

1,432,699, March 6, 1918). The object of the invention, as stated in an application for patent, "is to provide a food product corresponding to commercial unsweetened condensed or evaporated milk, which will be less expensive and possess superior keeping qualities. . . . In place of the extracted butter fat we substitute a foreign fat (preferably vegetable oil) which is less expensive than the original fat." In taste and appearance filled milks may not be distinguishable from evaporated milks, and when whipped they form a highly stable emulsion resembling whipped cream.

In the production of filled milk, practically all the milk fat (from 97 to 98 per cent) is removed, and a vegetable fat, refined coconut oil, is added. The mixture is homogenized and then concentrated to the desired consistency, automatically filled into cans, sealed and sterilized.

The Council was informed in February 1938 that a cod liver oil concentrate was then being added to Carolene and Milnut (evaporated filled milks) in amounts to provide 2,000 units of vitamin A and 400 units of vitamin D to each pint of the filled evaporated milk.

The approximate composition of evaporated filled milk is moisture 75 per cent, solids 26 per cent, protein (N $\times$ 6.38) 7 per cent, fat 6 per cent, ash 2 per cent and carbohydrates (by difference) 11 per cent.

In 1922, when the filled milk act was under consideration by Congress, nutrition experts testified at committee hearings that butterfat is rich in certain vitamins essential to health and that these vitamins are lacking in nearly all vegetable oils. It was also pointed out that because of this difference in nutritional value, the use of filled milk as a dietary substitute for milk might result in undernourishment in children. Reference was made to an outbreak of xerophthalmia in Danish children after the World War, an outbreak which had been the direct consequence of depriving these children of butterfat, which whole milk contains.

Without passing judgment on the filled milk statute itself, the Council desires only to point out that it is a fundamental policy of the Council that food products to be acceptable must comply with federal food regulations. The Council therefore does not accept filled milk products.

GOAT MILK

Goat milk is used for human consumption in many parts of the world. In the Alps and Mediterranean regions it is the chief milk used. Gamble and Ellis [8] conducted an extensive study of the composition of goat milk as compared with cow's milk. They reported that goat milk was similar to Holstein milk in percentage of water, protein, fat, and lactose. The

8. Gamble, J. A., and Ellis, N. R.: Composition and Properties of Goat's Milk as Compared with Cow's Milk, Technical Bulletin No. 671, United States Department of Agriculture, March 1939.

vitamin A content of goat milk was similar to that of Holstein milk but goat milk had a comparatively high potency in vitamin B_1 and G (riboflavin). Goat milk was found to be of low curd tension, as it was 31 per cent softer on the average than that of Holstein milk and 54 per cent softer than that of Jersey milk. Goat milk is sometimes specially useful in the feeding of infants who are allergic to cow's milk.

The goat milk that stands accepted by the Council is an evaporated product.

HOMOGENIZED MILK

The listed products of the following firms stand accepted:

Affholter Brothers Creamery, Wyandotte, Mich.

Anthony Pure Milk Company, Inc., Nashville, Tenn.

Avondale Farms, Knoxville, Tenn.

City Dairy Company, South Bend, Ind.

McDonald Dairy Co., Flint, Mich.

Mount Royal Dairies, Ltd., Montreal, Canada.

Nashville Pure Milk Company, Nashville, Tenn.

Oakland Dairy, Pontiac, Mich.

EVAPORATED MILK

The listed products of the following firms stand accepted:

Amboy Milk Products Co., Amboy, Ill.
AMBOY BRAND EVAPORATED MILK.
MELODY BRAND EVAPORATED MILK.

American Stores Dairy Co., Dundee, Ill.
ASCO BRAND EVAPORATED MILK.
FARMDALE BRAND EVAPORATED MILK.

Armour and Company, Chicago
ARMOUR'S BRAND EVAPORATED MILK.

Product distributed by Morris & Company, Chicago.
MORRIS SUPREME BRAND EVAPORATED MILK.

Badger Milk Products Company, Milwaukee; also known as Gehl's Guernsey Farms, Inc.
DOVE BRAND EVAPORATED MILK.
GEHL'S BRAND EVAPORATED MILK.
PURITY BRAND EVAPORATED MILK.

Bonduel Dairy Corporation, Bonduel, Wis. *See* Land O'Lakes Creameries, Inc., Minneapolis.

The Borden Company, New York.
BORDEN'S BRAND EVAPORATED MILK.
BORDEN'S OREGON BRAND EVAPORATED MILK.
MARICOPA BRAND EVAPORATED MILK.
PEARL BRAND EVAPORATED MILK.
ST. CHARLES BRAND EVAPORATED MILK.
SILVER COW BRAND EVAPORATED MILK.

Products distributed by The Borden Sales Company, Inc., New York.
BORDEN'S MISTLETOE BRAND EVAPORATED MILK.
BORDEN'S DIXIE BRAND EVAPORATED MILK.
ROSE BRAND EVAPORATED MILK.

The Borden Sales Company, Inc., New York. *See* The Borden Company, New York.

The Carnation Company, Milwaukee.
AMERICAN BRAND EVAPORATED MILK.
OATMAN'S BRAND EVAPORATED MILK.
OATMAN'S DUNDEE BRAND EVAPORATED MILK.
POPPY BRAND EVAPORATED MILK.

Product distributed by Hebe Company, Milwaukee and Seattle.
HEBE BRAND EVAPORATED MILK.

Product distributed by Mt. Vernon Milk Company, Seattle.
MT. VERNON BRAND EVAPORATED MILK.

Product distributed by Mohawk Milk Products Co., Inc., New York.
GOLD MEDAL BRAND EVAPORATED MILK.

Product distributed by Northfield Milk Products Company, Northfield, Minn.
NORTHFIELD BRAND EVAPORATED MILK.

Consolidated Badger Cooperative, Shawano, Wis. *See* Land O'Lakes Creameries, Inc., Minneapolis.

Consolidated Dairy Products Co., Seattle.
DARIGOLD BRAND EVAPORATED MILK.
FEDERAL BRAND EVAPORATED MILK.
GOLD COIN BRAND EVAPORATED MILK.

Dairy Belt Cheese & Butter Company, Spencer, Wis. *See* Dairy Belt Milk Products Company, Spencer Wis.

Dairy Belt Milk Products Company, Spencer, Wis., also known as Dairy Belt Cheese and Butter Company, Spencer, Wis.
MAYTIME BRAND EVAPORATED MILK.

Dairy Distributers, Inc., Milwaukee. *See* Watertown Milk Co., Watertown, Wis.

Dean Milk Company, Chicago.
DEAN'S BRAND EVAPORATED MILK.

The Defiance Milk Products Company, Defiance, Ohio.
BEAUTY BRAND EVAPORATED MILK.
DEFIANCE BRAND EVAPORATED MILK.
FOR-GET-ME-NOT BRAND EVAPORATED MILK.
MORNING GLORY BRAND EVAPORATED MILK.
SUNSHINE BRAND EVAPORATED MILK.

Evangeline Milk Co., Sawyer, Wis.
EVANGELINE BRAND EVAPORATED MILK.

Ewing-Von Allmen Dairy Company, Louisville, Ky.
EVA BRAND EVAPORATED MILK.
SWISS BRAND EVAPORATED MILK.

Gehl's Guernsey Farms, Inc., Milwaukee. *See* Badger Milk Products, Milwaukee.

General Food Products Co., Vernon, Calif. *See* Safeway Stores, Inc., Oakland, Calif.

Golden State Company, Ltd., San Francisco.
GOLDEN STATE BRAND EVAPORATED MILK.

Great American Tea Company, New York. *See* Great Atlantic and Pacific Tea Company, New York.

Great Atlantic & Pacific Tea Company, New York. Product distributed by Great American Tea Company, New York.
AMERT BRAND EVAPORATED MILK.

Product packed by White House Milk Co., Inc., Manitowoc, Wis.
WHITE HOUSE BRAND EVAPORATED MILK.

Hebe Company, Milwaukee and Seattle. *See* The Carnation Company, Milwaukee.

The Indiana Condensed Milk Company, Indianapolis.
WILSON'S BRAND EVAPORATED MILK.

John F. Jelke Co., Chicago.

Product distributed by John F. Jelke Company, Hillsboro, Wis.
CAPITOL BRAND EVAPORATED MILK.
JELKE GOOD LUCK BRAND EVAPORATED MILK.
VALUE BRAND EVAPORATED MILK.

John F. Jelke Co., Hillsboro, Wis. *See* John F. Jelke Co., Chicago.

Kroger Grocery and Baking Company, Cincinnati.

Product packed by Kroger Grocery and Baking Co., Angola, Ind.
KROGER'S COUNTRY CLUB BRAND EVAPORATED MILK.

Laing Products Sales Co., Ltd., Toronto, Canada. *See* Nestle's Milk Products, Inc., New York.

Land O'Lakes Creameries, Inc., Minneapolis.
LAND O'LAKES BRAND EVAPORATED MILK.

Product distributed by Consolidated Badger Cooperative, Shawano, Wis.
BADGER BRAND EVAPORATED MILK.

Product distributed by Bonduel Dairy Corporation, Bonduel, Wis.
SUNCREST BRAND EVAPORATED MILK.

Libby, McNeil and Libby, Chicago.
COTTAGE BRAND EVAPORATED MILK.
FOX RIVER BRAND EVAPORATED MILK.
LIBBY'S BRAND EVAPORATED MILK.
LIBBY'S PETER PAN BRAND EVAPORATED MILK.
PETER PAN BRAND EVAPORATED MILK.

Litchfield Creamery Company, Litchfield, Ill.
SUNSHINE BRAND EVAPORATED MILK.

Meyenberg Milk Products Company, Salinas, Calif.
MEYENBERG BRAND EVAPORATED MILK.

Product distributed by Wonder Milk Sales Company, Salinas, Calif.
WONDER BRAND EVAPORATED MILK.

Mohawk Milk Products Co., Inc., New York. *See* The Carnation Company, Milwaukee.

Morning Milk Company, Salt Lake City.
MORNING BRAND EVAPORATED MILK.

Morris & Company, Chicago. *See* Armour and Company, Chicago.

Mt. Vernon Milk Company, Seattle. *See* The Carnation Company, Milwaukee.

Nestle's Milk Products, Inc., New York.
ALPINE BRAND EVAPORATED MILK (one for export trade, another for United States).
BORDEN'S PEERLESS BRAND EVAPORATED MILK. (Spanish and English Labels.)
BORDEN'S ST. CHARLES BRAND EVAPORATED MILK. (Spanish and English Labels.)
EVERYDAY BRAND EVAPORATED MILK (for export only).
IDEAL BRAND EVAPORATED MILK.
LA LECHERA BRAND EVAPORATED MILK.
LION BRAND EVAPORATED MILK (for export only).
MILKMAID BRAND EVAPORATED MILK.
NESTLE'S BRAND EVAPORATED MILK.

Nestle's Milk Products (Canada), Ltd., Toronto, Canada.
SUN BRAND EVAPORATED MILK.

Product distributed by Laing Products Sales Co., Ltd., Toronto, Canada.
DOROTHY BRAND EVAPORATED MILK.

Northfield Milk Products Company, Northfield, Minn. *See* The Carnation Company, Milwaukee.

The Page Milk Company, Merrill, Wis.
ELITE BRAND EVAPORATED MILK.
KIT BRAND EVAPORATED MILK.
PAGE BRAND EVAPORATED MILK.

Pevely Dairy Company, St. Louis.
SUNNY DELL BRAND EVAPORATED MILK.

Producer's Creamery, Marion, Ind.
LAVERING FARM BRAND EVAPORATED MILK.
VALLEY LEA BRAND EVAPORATED MILK.

Rieck-McJunkin Dairy Company, Pittsburgh.
FARMFRESH BRAND EVAPORATED MILK
RIECK'S PRIVATE BRAND EVAPORATED MILK.

Roberts Dairy Company, Omaha.
ROBERTS BRAND EVAPORATED MILK.

Safeway Stores, Inc., Oakland, Calif. Products packed by Lucerne Cream and Butter Company, Oakland, Calif
CHERUB BRAND EVAPORATED MILK

Product distributed by General Food Products Co., Vernon, Calif.
SUNNY SKIES BRAND EVAPORATED MILK

Sheffield Condensed Milk Co., Inc., New York.
SHEFFIELD "SEALFCT" BRAND EVAPORATED MILK

The United Dairy Company, Barnesville, Ohio.
BELMONT BRAND EVAPORATED MILK.
BROOKMONT BRAND EVAPORATED MILK.
HANDY BRAND EVAPORATED MILK.
HURON BRAND EVAPORATED MILK.
KEYSTONE BRAND EVAPORATED MILK.
UNITED BRAND EVAPORATED MILK.

Van Camp Milk Company, Indianapolis.
VAN CAMP'S BRAND EVAPORATED MILK.

Verifine Dairy Products Company, Sheboygan, Wis.
VERIFINE BRAND EVAPORATED MILK.

Watertown Milk Cooperative, Watertown, Wis. Product distributed by Dairy Distributers, Inc., Milwaukee.
DAIRY DISTRIBUTERS BRAND EVAPORATED MILK.
DELLA MAE BRAND EVAPORATED MILK.
BONNY LEE BRAND EVAPORATED MILK.

Westerville Creamery Company, Covington, Ohio.
DA LEE BRAND EVAPORATED MILK.
MIAMI VALLEY BRAND EVAPORATED MILK.
PITCHERS BEST BRAND EVAPORATED MILK.
SHADY NOOK BRAND EVAPORATED MILK.
SPRING FARM BRAND EVAPORATED MILK.

White House Milk Co., Inc., Manitowoc, Wis. *See* Great Atlantic and Pacific Tea Company, New York.

Windsor Evaporated Milk Company, Cleveland.
BELLE VERNON BRAND EVAPORATED MILK.
WINDSOR BRAND EVAPORATED MILK.

The following firms distribute under their own labels evaporated milk products purchased from manufacturers of accepted products now privileged to use the seal. The labels and advertising conform to the Council Rules and Decisions.

Acme Markets, Inc., Philadelphia.
BONNIE OAK BRAND EVAPORATED MILK.

E. Bierhaus & Sons, Vincennes, Ind.
SCOUT CABIN BRAND EVAPORATED MILK.

Blue Mountain Sales Company, Providence, R. I.
SUNNY FARM BRAND EVAPORATED MILK.

Butler Coal and Grain Co., Adams, Mass.
BERKSHIRE HILLS BRAND EVAPORATED MILK.

Product also distributed by Butler Flour Company, Pittsfield, Mass.
BERKSHIRE HILLS BRAND EVAPORATED MILK.

Cardinal Milk Sales Company, Dundee, Ill.
BABY'S CHOICE BRAND EVAPORATED MILK.

Cassel's Stores, Reading, Pa.
CASSEL'S BRAND EVAPORATED MILK.

Central Grocers, Inc., Boston.
CENTRAL'S BRAND EVAPORATED MILK.

Central Wholesale Grocers, Inc., Chicago.
CENTRELLA BRAND EVAPORATED MILK.

Challenge Cream and Butter Association, Los Angeles.
BANNER BRAND EVAPORATED MILK.

Chapin Grocery Specialties Company, Inc., Springfield, Mass.
CHAPIN BRAND EVAPORATED MILK.

Christiansburg Canning Co., Pulaski, Va.
MISS VIRGINIA BRAND EVAPORATED MILK.

Clover Farm Stores Corporation, Cleveland.
CLOVER FARM BRAND EVAPORATED MILK.

Product distributed by Foodland, Inc., Cleveland.
FOODLAND BRAND EVAPORATED MILK.

Commonwealth Grocery Company, Boston, Mass.
SUNNYROSE BRAND EVAPORATED MILK.

C. A. Cross & Co., Inc., Fitchburg, Mass.
RED AND WHITE BRAND EVAPORATED MILK.

Daniel Grocer Company, Murphysboro, Ill.
DANIEL'S PRIDE BRAND EVAPORATED MILK.

Dixie Home Stores, Greenville, S. C.
DIXIE HOME BRAND EVAPORATED MILK.

Downing Brother's Dairy, Rock Island, Ill.
DOWNING BRAND EVAPORATED MILK.

Drake and Company, Inc., Easton, Pa.
DRAKO BRAND EVAPORATED MILK.

Durand, McNeil, Horner Company, Chicago.
NONE-SUCH BRAND EVAPORATED MILK.

The Eavey Company, Xenia, Ohio.
GREEN PASTURES BRAND EVAPORATED MILK.

Economy Grocery Stores Corp., Boston.
COUNTRYSIDE BRAND EVAPORATED MILK.

E. J. Evans Company, Van Wert, Ohio.
E-JAY BRAND EVAPORATED MILK.

Foodland, Inc., Cleveland. *See* Clover Farm Stores Corporation, Cleveland.

Forest City Wholesale Grocery Co., Inc., Rockford, Ill.
FORESCO BRAND EVAPORATED MILK.

Gamble-Robinson Company, Minneapolis.
STANDBY BRAND EVAPORATED MILK.

General Grocers Co-operative Corporation, Chicago.
LUSH'US BRAND EVAPORATED MILK.

Griffin Grocery Company, Muskogee, Okla.
GRIFFIN'S BRAND EVAPORATED MILK.

Grosberg-Cramer Company, Amsterdam, N. Y. *See* Sweet Life Food Corporation, Brooklyn.
SWEET LIFE BRAND EVAPORATED MILK.

Grosberg & Reuter, Detroit. *See* Sweet Life Food Corporation, Brooklyn.
SWEET LIFE BRAND EVAPORATED MILK.

Grower's Outlet, Inc., Chicopee, Mass.
LOVERING FARM BRAND EVAPORATED MILK.

Hale-Halsell Company, McAlester, Okla.
HALE'S PRIDE BRAND EVAPORATED MILK.

S. Hamill Company, Keokuk, Iowa.
HAMILL'S PALM BRAND EVAPORATED MILK.

Holyoke Wholesale Grocery Company, Holyoke, Mass.
NONOTUCK BRAND EVAPORATED MILK.

L. A. Jackson, Inc., Indianapolis. *See* Standard Grocery Co., Indianapolis.

Joannes Brothers Company, Green Bay, Wis.
VOLUNTEER BRAND EVAPORATED MILK.

Jobbers Service Incorporated, Coldwater, Mich.
ISBEST BRAND EVAPORATED MILK.

Howard E. Jones & Company, Baltimore.
BUDDIE BRAND EVAPORATED MILK.

Kansas City Wholesale Grocery Co., Kansas City, Mo.
PICKWICK BRAND EVAPORATED MILK.

Kasdum Company, Steubenville, Ohio.
KASDUM BRAND EVAPORATED MILK.

H. Kellogg & Sons, Philadelphia.
KELLOGG'S BRAND EVAPORATED MILK.

Kenosha Wholesale Grocery Company, Kenosha, Wis.
OUR OWN BRAND EVAPORATED MILK.

Keystone Grocery Company, Inc., Harrisburg, Pa.
KEYSTONE BRAND EVAPORATED MILK.

Kettler-Willar Company, Worcester, Mass.
DINNER BELL BRAND EVAPORATED MILK.

Koppers Stores, Inc., Pittsburgh.
KOPPERS STORES BRAND EVAPORATED MILK.

Kroger Grocery & Baking Company, Cincinnati.
KROGER'S COUNTRY CLUB BRAND EVAPORATED MILK.

Products distributed by Wesco Foods Company, Cincinnati.
HY-SCORE BRAND EVAPORATED MILK.
WESCO BRAND EVAPORATED MILK.

Alfred Lowry & Bro., Philadelphia.
TARTAN BRAND EVAPORATED MILK

H. A. Marr Grocery Company, Denver.
MARCO BRAND EVAPORATED MILK

A. L. Mars Company, Pittsburgh. *See* Sweet Life Food Corporation, Brooklyn
SWEET LIFE BRAND EVAPORATED MILK.

L. C. Mercantile Company, Inc., Fort Wayne, Ind.; Mendota, Quincy, Springfield and Danville, Ill.
L. C. BRAND EVAPORATED MILK

Mohican Company, New York.
MOHICAN BRAND EVAPORATED MILK

William Montgomery & Company, Philadelphia.
MONTCO BRAND EVAPORATED MILK

M. Muskal, Chicago.
LADY CLARE BRAND EVAPORATED MILK.

National Retailer-Owned Grocers, Inc., Chicago.
SHURFINE BRAND EVAPORATED MILK.

The National Tea Company, Chicago.

Product distributed by George Rasmussen Co., Chicago
NATIONAL BRAND EVAPORATED MILK.

Northern Products Company, Inc., Malden, Mass.
MALDEN BRAND EVAPORATED MILK.

North Side Packing Company, Merrill, Wis.
VICTORY BRAND EVAPORATED MILK.

Oakford Company, Peoria, Ill.
BLUE RIBBON BRAND EVAPORATED MILK.

Oakley Economy Stores, Terre Haute, Ind.
HOLLIEANNA BRAND EVAPORATED MILK.

Pittsburgh Provision & Packing Company, Pittsburgh.
ALLERTON FARM BRAND EVAPORATED MILK.

Plee-Zing, Inc., Chicago.
PLEE-ZING BRAND EVAPORATED MILK.

Powell Brokerage Company, Richmond, Va.
FAIRFAX HALL BRAND EVAPORATED MILK.

Products Corporation of America, Chicago.
GOLDBLATT'S BOND BRAND EVAPORATED MILK.

The Ranney-Davis Mercantile Company, Arkansas City and Wichita, Kan.
SANTA FE BRAND EVAPORATED MILK.

George Rasmussen Co., Chicago. *See* The National Tea Company, Chicago.

Reading Wholesale Grocery Company, Reading, Pa.
BERKSHIRE BRAND EVAPORATED MILK.

Red & White Corporation, Chicago.
RED & WHITE BRAND EVAPORATED MILK.

Rival Foods, Inc., Cambridge, Mass.
RIVAL BRAND EVAPORATED MILK.

Nathan Rosenblum and Company, Sharon, Pa.
GOLDEN DAWN BRAND EVAPORATED MILK.

Russell Hall Company, Meriden, Conn.
CASTLE GARDEN BRAND EVAPORATED MILK.

Frank Schaaf Company, Milwaukee.
SCHAAF'S "FAVORED FOR FLAVOR" BRAND EVAPORATED MILK.

Schuylkill Valley Grocery Co., Inc., Norristown, Pa.
NORRIS BRAND EVAPORATED MILK.

Seeman Brothers, Inc., New York.
BUTTERCUP BRAND EVAPORATED MILK.

The Sheffield Condensed Milk Company, New York.
SHEFFIELD "SEALECT" BRAND EVAPORATED MILK.

Standard Grocery Company, Indianapolis.
Product distributed by L. A. Jackson, Inc., Indianapolis.
SO-FRESH BRAND EVAPORATED MILK.

Wm. Steinmeyer Company, Milwaukee.
MEADOWMERE BRAND EVAPORATED MILK.

Suffolk Grocery Company, Inc., Boston.
SUFFOLK BRAND EVAPORATED MILK.

Sunbury Wholesale Grocery Company, Sunbury, Pa.
KEYSTONE BRAND EVAPORATED MILK.

Sweet Life Food Corporation, Brooklyn. Product distributed by Grosberg and Reuter, Detroit; Grosberg-Cramer Company, Amsterdam, N. Y.; and A. L. Mars and Company, Pittsburgh.
SWEET LIFE BRAND EVAPORATED MILK.

Swift and Company, Chicago.
SWIFT'S BRAND EVAPORATED MILK.

Tom-Boy Stores, Inc., St. Louis, Mo.
TOM-BOY BRAND EVAPORATED MILK.

Topeka Wholesale Grocery Co., Topeka, Kan.
ANNA DALE BRAND EVAPORATED MILK.

Twin City Wholesale Grocer Co., Fargo, N. D.; St. Paul and Minneapolis.
FAIRWAY WHITE LABEL BRAND EVAPORATED MILK.

Twin Ports Wholesale Grocer Co., Duluth, Minn., and Superior, Wis.
FAIRWAY WHITE LABEL BRAND EVAPORATED MILK.

Union Condensed Milk Company, Chicago.
COMET BRAND EVAPORATED MILK.
TARGET BRAND EVAPORATED MILK.

Union Fruit Corporation, Schenectady, N. Y.
SUPER'S BEST BRAND EVAPORATED MILK.

United Public Markets Inc., Providence, R. I.
BONNIE BRAND EVAPORATED MILK.

United Wholesale Grocery Company, Pottsville, Pa.
KEYSTONE BRAND EVAPORATED MILK.

Universal Food Stores, Inc., Norwich, Conn. *See* **The Yantic Grain & Products Company, Norwich, Conn.**

The Val Decker Packing Co., Piqua, Ohio.
DECKER'S PIQUALITY BRAND EVAPORATED MILK.

Vermont Tea and Butter Company, Andover, Mass.
VERMONT BRAND EVAPORATED MILK.

Volunteer Stores, Inc., of America, Chicago.
VOLUNTEER BRAND EVAPORATED MILK.

Waples Platter Company, Fort Worth, Texas.
WHITE SWAN BRAND EVAPORATED MILK.

Wesco Foods Company, Cincinnati. *See* Kroger Grocery & Baking Company, Cincinnati.

L. Wiemann Company, Milwaukee.
WIEMANN'S BRAND EVAPORATED MILK.

Wilson Mercantile Company, Wausau and Rhinelander, Wis.
VALLEY QUEEN BRAND EVAPORATED MILK

Wilkinson Gaddis & Company, Newark, N. J.
IDEAL BRAND EVAPORATED MILK.

Winfield Wholesale Grocery Company, Wichita and Winfield, Kan.
WINFIELD SUPREME BRAND EVAPORATED MILK

Winner Market, Lock Haven, Pa.
MILL BROOK BRAND EVAPORATED MILK.

Wood County Grocer Co., Wisconsin Rapids, Wis.
FAIRWAY WHITE LABEL BRAND EVAPORATED MILK.

Wulfing Grocer Company, St. Louis.
HAPPY HOUR BRAND EVAPORATED MILK.

The Yantic Grain & Products Company, Norwich, Conn.
Product distributed by Universal Food Stores, Inc., Norwich, Conn.
THAMES VALLEY BRAND EVAPORATED MILK.

Zimmermann Brothers, Lock Haven, Pa.
PHYLLIS XXXXX BRAND EVAPORATED MILK.

GOAT MILK

The listed product of the following firm stands accepted:

Meyenberg Milk Products Company, Salinas, Calif.
MEYENBERG BRAND EVAPORATED GOAT MILK.

Analysis (submitted by manufacturer).—Moisture 75.7%, total solids 24.3%, ash 1.6%, fat (ether extract) 7.2%, protein (N $\times$ 6.38) 8.0%, sucrose none, lactose 8.4%.

Calories.—1.3 per gram; 37 per ounce.

SWEETENED CONDENSED MILK

The listed products of the following firms stands accepted:

The Great Atlantic and Pacific Tea Company, New York. *See* The Quaker Maid Company, Inc., New York.

Nestle's Milk Products, Inc., New York.
LION BRAND SWEETENED CONDENSED MILK.
NESTLE'S BRAND SWEETENED CONDENSED MILK.
SILVER BRAND SWEETENED CONDENSED MILK.

Product distributed by Universal Milk Company, New York and San Francisco.
ARROW BRAND SWEETENED CONDENSED MILK.

The Quaker Maid Company, Inc., New York. Product distributed by The Great Atlantic and Pacific Tea Company, New York.

WHITE HOUSE BRAND SWEETENED CONDENSED MILK.

Universal Milk Company, New York. *See* Nestle's Milk Products, Inc., New York.

DRIED MILK

The listed products of the following firms stands accepted:

The Borden Company, New York.

DRYCO BRAND IRRADIATED DRIED SKIMMED MILK. See Irradiated Milk.

MERRELL-SOULE BRAND POWDERED SKIMMED MILK, spray dried skimmed milk.

Analysis (submitted by manufacturer).—Moisture 2.5%, fat 1.0%, protein 36.5%, lactose 51.8%, mineral matter 7.9%.

Calories.—3.62 per gram; 103 per ounce.

Product distributed by Merrell-Soule Company, New York.

KLIM BRAND POWDERED WHOLE MILK, spray dried whole milk.

Analysis (submitted by manufacturer).—Moisture 1.5%, ash 5 8%, fat 28.0%, protein 26.7%, lactose 38.0%.

Calories.—5 11 per gram; 145 per ounce.

Mead Johnson & Company, Evansville, Ind.

MEAD'S BRAND POWDERED WHOLE MILK, spray dried whole milk.

Analysis (submitted by manufacturer).—Moisture 1.5%, ash 6.0%, fat 28.0%, protein (N × 6.38) 26.8%, lactose (by difference) 37.7%, calcium (Ca) 0.88%, phosphorus (P) 0.72%, magnesium (Mg) 0.08%, sodium (Na) 0.44%, potassium (K) 1.16%, sulfur (S) 0.05%, chlorine (Cl) 0.77%, iron (Fe) 0.0012%, copper (Cu) 0.0005%.

Calories.—5.1 per gram; 145 per ounce.

ALACTA BRAND POWDERED SKIMMED MILK, spray dried skimmed milk.

Analysis (submitted by manufacturer).—Moisture 1.5%, mineral salts 7.0%, milk-fat 12.0%, protein (N × 6.38) 33.0%, lactose 46.5%.

Calories.—4.25 per gram; 121 per ounce.

Merrell-Soule Company, New York. *See* The Borden Company.

MALTED MILK

The listed products of the following firms stand accepted:

The Borden Company, New York.

THOMPSON'S BRAND READY MIXED MALTED MILK, consisting of malted milk, sucrose and cocoa.

Analysis (submitted by manufacturer).—Moisture 1.9%, ash 2.2%, fat (ether extract) 5.8%, protein (N × 6.25) 7.8%, crude fiber none, reducing sugars as maltose (before inversion) 35.1%, sucrose * 40.9%, carbohydrates (by difference) 82.3%, theobromine and caffeine * 0.15%.

Calories.—4.1 per gram; 116 per ounce.

Product distributed by Borden's Milk Products Company, Inc., New York.

BORDEN'S BRAND MALTED MILK, consisting of whole milk, wheat, flour, barley malt and sodium chloride.

Analysis (submitted by manufacturer).—Moisture 2.0%, ash 3.6%, fat (ether extract) 9.2%, protein (N × 6.25) 15.5%, crude fiber 0.1%, reducing sugar as maltose (including lactose and maltose) 50.0%, dextrins (alcoholic precipitation method) 19.6%, carbohydrates other than crude fiber (by difference) 69.6%.

---

* Estimated.

Calories.—4.2 per gram; 119 per ounce.

Vitamins.—Report of biologic assay submitted by manufacturer in 1930 shows approximately 180 U. S. P. units of vitamin A, 70 Sherman-Chase units of vitamin B and 60 Sherman-Bourquin units of vitamin G per ounce.

Borden's Milk Products Company, Inc., New York. *See* The Borden Company, New York.

Carnation Company, Milwaukee.

CARNATION BRAND MALTED MILK, consisting of whole milk, barley malt and malted wheat flour.

Analysis (submitted by manufacturer).—Moisture 2.7%, ash 2.3%, fat (ether extract) 8.4%, protein (N × 6.25) 12.8%, crude fiber 0.3%, carbodrates other than crude fiber (by difference) 73.5%, chloride (Cl) 0.39%, sodium (Na) 0.42%, potassium (K) 0.37%, calcium (Ca) 0.25%.

Calories.—4.2 per gram; 119 per ounce.

CHOCOLATE FLAVORED DRINKS CONTAINING SKIMMED MILK

Choc-Lade Drinks

Beverage Base

The chocolate beverage base product of the following firm stands accepted:

Siren Mills Division, Peter Cailler Kohler Swiss Chocolates Co., Inc., New York.

CHOC-LADE DAIRY DRINK POWDER, containing a mixture of cocoa, starch-free powdered cane sugar, vegetable emulsifying agent, salt and vanillin flavoring.

Analysis (submitted by manufacturer).—Moisture 3.3%, ash 5.1%, fat 9.9%, protein (N × 6.25) 9.2%, sucrose 30%, crude fiber 2.6%, carbohydrates other than crude fiber (by difference) 70%, caffeine and theobromine 0.94%.

Calories.—4.06 per gram; 115 per ounce.

Beverage

CHOC-LADE CHOCOLATE FLAVORED DRINK, pasteurized skimmed milk flavored with Choc-Lade Dairy Drink Powder.

Analysis (submitted by manufacturer).—Moisture 81.5%, ash 0.9%, fat (ether extract) 2%, protein (N × 6.25) 3.6%, reducing sugars as lactose 4.9%, sucrose (copper reduction method) 6.0%, crude fiber 0.1%, carbohydrates other than crude fiber (by difference) 11.9%, caffeine and theobromine 0.01%.

Calories.—0.64 per gram; 18 per ounce.

The Choc-Lade Chocolate Flavored Drinks of the following firms stand accepted:

Aines Farm Dairy Company, Kansas City, Mo.

Baldwin's Mt. Pleasant Farm, Livingston, N. J.

Bell Brook Dairies, Inc., San Francisco.

Boone Dairy Inc., Boone, Iowa.

Clover Leaf Dairy Company, Racine, Wis.

Cloverdale Creamery, Centerville, Calif.

Lakeside Dairy, Mt. Pleasant, Mich.

Schaeffer's Dairy, Clare, Mich.

Five-O Drinks

Beverage Base (Powder)

The chocolate beverage base product of the following firm stands accepted:

The Krim-Ko Company, Chicago.

FIVE-O POWDER, consisting of a mixture of skimmed milk powder, cocoa, dextrose, salt and a stabilizer; flavored with vanillin.

Analysis (submitted by manufacturer).—Moisture 4.1%, total solids 95.9%, ash 8.2%, fat (ether extract) 4.7%, protein (N × 6.25) 28.8%, crude fiber 0.8%, nitrogen-free extract 54.2%, reducing sugars as invert 0.0%, sucrose 0.0%, carbohydrates other than crude fiber (by difference) 53.4%, theobromine and caffeine (Decker-Kunze method) 0.17%.

Calories.—3.7 per gram; 105 per ounce.

Beverage

FIVE-O CHOCOLATE FLAVORED DRINK, containing a pasteurized mixture of water, cane sugar and Five-O Powder. The beverage contains about 4.3 per cent milk solids by calculation from composition of Five-O Powder.

Analysis (submitted by manufacturer).—Moisture 87.7%, total solids 12.3%, ash 0.4%, fat (ether extract) 0.3%, protein (N × 6.25) 1.8%, crude fiber 0.1%, lactose 2.1%, carbohydrates other than crude fiber (by difference) 9.7%, theobromine and caffeine 0.01%.*

Calories.—0.49 per gram; 13.9 per ounce.

The Five-O Chocolate Flavored Drinks of the following firms stand accepted:

Alamito Dairy Company, Omaha.

Iowa Bottling Company, Clinton, Iowa.

Prairie View Dairy, Breese, Ill.

J. A. Schultz and Sons, Big Flats, N. Y.

Virginia Pepsi-Cola Company, Charlottesville, Va.

Beverage Base (Syrup)

The chocolate beverage base product of the following firm stands accepted:

The Krim-Ko Company, Chicago.

FIVE-O SYRUP, consisting of sucrose, water, chocolate and cocoa, tapioca flour, salt, agar, tartaric acid; flavored with vanillin and coumarin.

Analysis (submitted by manufacturer).—Moisture 23.0%, ash 1.7%, fat (ether extract) 4.9%, protein (N × 6.25) 1.9%, reducing sugars as invert sugar 39.9%, sucrose (copper reduction method) 18.5%, crude fiber 0.5%, carbohydrates other than crude fiber (by difference) 68.0%, caffeine and theobromine 0.21%.

Calories.—3.2 per gram; 91 per ounce.

Beverage

FIVE-O CHOCOLATE FLAVORED DRINK, containing pasteurized skimmed milk, water, flavored with Five-O Syrup.

Analysis (submitted by manufacturer).—Moisture 85.3%, ash 0.6%, fat (ether extract) 0.6%, protein (N × 6.25) 1.6%, reducing sugars as invert sugar 4.5%, reducing sugars as lactose 1.1%, sucrose (copper reduction method) 4.2%, crude fiber 0.1%, carbohydrates other than crude fiber (by difference) 11.8%, caffeine and theobromine 0.02%.†

Calories.—0.6 per gram; 17 per ounce.

* Calculated from composition of Five-O Powder.
† Calculated from composition of Five-O Syrup.

The Five-O Chocolate Flavored Drinks of the following firms stand accepted:

Alamito Dairy Company, Omaha.

Edwardsville Creamery Co., Edwardsville, Ill.

Fort Dodge Creamery Company, Fort Dodge, Iowa.

Mahaska Bottling Works, Oskaloosa, Iowa.

Producers Cooperative Dairy, Quincy, Ill.

H. M. Richardson, Utica, N. Y.

Superior Dairy, Canton, Ohio.

Krim-Ko Drinks

Beverage Base

The chocolate beverage base product of the following firm stands accepted:

Krim-Ko Company, Chicago.

KRIM-KO CHOCOLATE FLAVORED SYRUP, containing a mixture of sugar, water, tapioca flour, cocoa, chocolate liquor, salt, vanillin flavoring and tartaric acid.

Analysis (submitted by manufacturer).—Moisture 22.1%, total solids 77.9%, ash 1.0%, fat (ether extract) 5.1%, protein (N × 6.25) 2.6%, crude fiber 0.5%, carbohydrates other than crude fiber (by difference) 68.7%, reducing sugars as invert 34.8%, sucrose 22.3%, nitrogen-free extract 69.2%, theobromine and caffeine (Decker-Kunze method) 0.12%.

Calories.—3.3 per gram; 93 7 per ounce.

Beverage

KRIM-KO CHOCOLATE FLAVORED DRINK, pasteurized skimmed milk[1] flavored with Krim-Ko Chocolate Flavored Syrup.

Analysis (submitted by manufacturer).—Moisture 83.2%, total solids 16.8%, ash 0.7%, fat (ether extract) 1.5%, protein (N × 6.25) 3.0%, lactose 2.23%, reducing sugars other than lactose as invert sugar 4.8%, sucrose 2.7%, crude fiber 0.04%, carbohydrates other than crude fiber (by difference) 11.1%, calcium (Ca) 0.1%, phosphorus (P) 0.1%, caffeine and theobromine 0.01%.*

Calories.—0.69 per gram; 20 per ounce.

The following firms bottle and distribute Krim-Ko Chocolate Flavored Drinks, Patent Nos.: 1,617,721 (2-15-27); 1,710,504 (4-23-29); 1,710,505 (4-23-29); 1,710,506 (4-23-29); 1,710,507 (4-23-29); 1,710,508 (4-23-29):

Alamito Dairy Company, Omaha.

Albia Dairy, Albia, Iowa.

Andrian County Dairy, Mexico, Mo.

Leon R. Aldrich, North Springfield, Vt.

The Allegan Dairy, Allegan, Mich.

Allumbaugh Dairy, Tracy, Minn.

Allvine Dairy Company, Kansas City, Kan.

Altenburg Dairy, Stevens Point, Wis.

Amsterdam Dairy, Schenectady, N. Y.

Anamosa Farmers Creamery Co., Anamosa, Iowa.

Anderson Creamery Dairy, Anderson, S. C.

Anthony Pure Milk Company, Nashville, Tenn.

* Calculated from composition of Krim-Ko Syrup.

1. Except in localities which have regulations requiring that whole milk be used.

Arlington Dairy, Bangor, Mich.
Ash Grove Dairy, Kankakee, Ill.
Atlantic Dairy, Atlantic, Iowa.
The Avalon Dairy Company, Middletown, Ohio
Avondale Farms, Knoxville, Tenn.
Babcock Dairy Company, Toledo, Ohio.
Baker-Hubbell Dairy, Inc., Peoria, Ill.
Balazs Dairy Products, Cleveland.
Bald Eagle Dairy, Lock Haven, Pa.
Bareman Brothers Dairy, Holland, Mich.
Barney's Dairy, Rumney Depot, N. H.
Basset's Dairy, Monticello, Fla.
Bayside Dairy Farms, Sarasota, Fla.
Beardsley Milk Co., Denton, Md.
Beaulac's Ideal Dairy, Berlin, N. H.
Beaupre & Sons, St. Anne, Ill.
Beaver Dam Dairy Co., Beaver Dam, Wis.
Bechtel's Dairy, Royersford, Pa.
Beechmont Dairy, Bridgeport, Conn.
Beeler Dairy, Madison, Ind.
Belle Isle Dairy, Inc., Akron, Ohio.
M. B. Beller Dairy, Vinton, Iowa.
Berkey Dairy, Flora, Ind.
Berkeley Springs Dairy, Berkeley Springs, W. Va.
Biltmore Dairy Farms, Inc., Charlotte, N. C.
Birtcherd Dairy, Inc., Norfolk, Va.
Blanding Dairy, St. Johns, Mich.
Blish's Dairy, Sturgeon Bay, Wis.
Blue Valley Creamery Company, Cedar Rapids, Iowa.
Blue Valley Creamery Company (also known as Topaz Dairy), Hastings, Neb.
Blue Valley Creamery Company, Parsons, Kan.; St. Joseph, Mo.; Watertown, S. D.
Bomgardner Dairy, Palmyra, Pa.
Bonfoey's Dairy, Three Rivers, Mich.
Booker Ice Cream Co., Inc., De Land, Fla.
Bowman Farm Dairy, Madison, Wis.
Boyd's Dairy, Killbuck, Ohio.
Braden Dairy and Ice Cream, Pratt, Kan. *See* Brookside Dairy, Hutchinson, Kan.
Bredehoft Dairy Division, Beatrice Creamery Co., Danville, Ill.
Brewster Dairy, Brewster, Ohio.
Briggs Dairy Company, Inc., Galveston, Texas.
N. S. Briggs & Sons Dairy, Dunkirk, N. Y.
Brinkman Dairy Company, Watertown, Wis.
Harry R. Brooks, St. Albans, Vt.
Brookale Dairy, White Water, Wis.
Brookside Dairy, Hutchinson, Kan., and Braden Dairy and Ice Cream, Pratt, Kan.
Brookside Dairy, Chicago Heights, Ill.
Brown Ice Cream & Milk Company, Bowling Green, Ky.
Brown Swiss Dairy, Monroe, Wis.

Buckley Dairy, Fort Smith, Ark.
Buckman's Dairy, Amsterdam, N. Y.
Bupp's Hi-Grade Dairy, York, Pa.
Burkholder's Sainitary Dairy, Decatur, Ill.
Burnett Brothers Dairy, Bradenton, Fla.
Cadillac Dairy, Cadillac, Mich.
Cannon Dairy, Dade City, Fla.
Capitol Dairies, Inc., Indianapolis.
Carlyle's Dairy, Inc., Bedford, Va.
Carnation Company, Fresh Milk & Ice Cream Division, Seattle.
Carnation Company, Waterloo, Iowa.
Carolina Dairy, Inc., Shelby, N. C.
Carolina Dairy Products, Inc., Greenville, N. C.
Carver's Dairy, Boyertown, Pa.
Central Dairy, Mason, Mich.
Central Dairies, Inc., Columbia, S. C.
Central Dairy Products Company, Willmar, Minn.
Central Illinois Dairy Products Co., Peru, Ill. Product also distributed in La Salle and Oglesby, Ill.
Chappell's Milk and Beverage Co., Harlan, Ky.
Chippewa Model Dairy, Chippewa Falls, Wis.
Christoph's Dairy, Waupaca, Wis.
Citizen's Dairy Company, Springfield, Ohio.
City Dairy Company, South Bend, Ind.
City Dairy, Horicon, Wis.
Clark's Homewood Farms Dairy, Tomahawk, Wis.
Clearview Dairy, Tuscola, Ill.
Cliffside Dairy, Galax, Va.
Clover Cream Dairy Products Co., Marshfield, Wis.
Cloverdale Dairy, Lawrenceburg, Ind.
Clover Leaf Dairy, Washington Court House, Ohio.
Cloverleaf Dairy, Valparaiso, Ind.
Coker Ice Cream Co., Quanah, Texas.
Cold Spring Creamery, Inc., Roanoke, Va.
Collier Bros. Creamery, Martinsville and Spencer, Ind., and Taylorsville, Ill.
Colonial Dairy Company, Wood River, Ill.
Comal Creamery, New Baunfels, Texas.
Concordia Creamery Company, Concordia, Kan.
Connor Dairy Products Company, Coshocton, Ohio.
Consolidated Badger Co-op., Appleton, Wis.
Consumer's Milk & Ice Cream Co., West Bend, Wis.
Corbin Milk Company, Corbin, Ky.
Corning Milk and Cream Co., Corning, N. Y.
Coss Dairy, Dixon, Ill.
Crescent Creamery, Reno, Nev.
Crystal Dairy, Springfield, Ill.; Warsaw, Ind.
Dacken's Dairy, Mt. Vernon, Iowa.
Dairy Dale, Wadsworth, Ohio.
Dairymen's League Co-operative Association, Inc., New York.
Product is bottled and distributed by a branch at Buffalo.
Product bottled at a branch in New York is distributed by a branch at Newark, N. J.

Darmville Dairy, Danville, Pa.
Datson Dairies, Inc., Orlando, Fla.
David's Dairy, Sturgis, Mich.
Davis Dairy, Ltd., Uhrichsville, Ohio.
Dayton Home Dairy Company, Dayton, Ohio.
DeKalb Dairy Company, DeKalb, Ill.
Dinsmore Dairy Co., Jacksonville, Fla.
Donegan Certified Dairy, Largo, Fla.
Drew's Dairy, Inc., Augusta, Maine.
Dudley Dairy Products Company, Paducah, Ky.
Dundee Dairy, Dundee, Mich.
Early Dawn Co-operative Dairy, Inc., Waynesboro, Va.
Ebenezer Dairy, Ebenezer, N. Y.
Eckert Dairy, Homeworth, Ohio.
The Eldridge Dairy Company, Hagerstown, Md.
Elm Farm Dairy, Medina, Ohio.
Elmore's Creamery, Elwood, Ind.
Elyria Dairies, Inc., Elyria, Ohio.
Empire Dairy, Oelwein, Iowa.
Enid Cooperative Creamery Association, Enid, Okla.
Escanaba Dairy, Escanaba, Mich.
Excelsior Sanitary Dairy, Frederick, Md.
Fagg's Dairy, Eldora, Iowa.
Fairfield Creamery Co., Fairfield, Ill.
Fairview Sanitary Dairy, Anderson, Ind.
Fargo Dairy, Inc., Batavia, N. Y.
Farmer's Dairy Cooperative, Cleona, Pa.
Farmer's Co-operative Dairy, Troy, Ohio.
Farmers Cooperative Dairy, Greenville, Ohio.
Farmers Co-operative Dairy Association, Connellsville, Pa.
Farmers Creamery Co., Fredericksburg, Va.
Farmers Equity Union Creamery Co., Lima, Ohio.
Favorite Dairy, Fort Madison, Iowa.
Feemster's Dairy, Rock Hill, S. C.
F & F Quality Dairy, Huntington, Ind.
Fischl Ice Cream and Dairy Company, Manitowoc, Wis.
Fort Dodge Creamery Co., Fort Dodge, Iowa.
Franklin Sanitary Dairy, Franklin, Ohio.
Frazier's Dairy, Frankfort, Ind.
Ray A. Fullerton Dairy, Lincoln, Ill.
Furer's Dairy, Tarentum, Pa.
Garner Dairy Company, Uniontown, Pa.
Gateway Creamery Company, Joplin, Mo.
Gear Dairy Company, Menasha, Wis.
Gem City Dairy, Baraboo, Wis.
Gillespie Dairy Company, Gillespie, Ill.
Gillette Dairy, Norfolk, Neb.
Gleason Dairy, Geneva, Ohio.
Glenville Dairy, Cleveland.
Glenwood Creamery, Glenwood, Iowa.
Gnau Brothers Dairy, Tell City, Ind.

Golden Cream Dairy, Shelbyville, Ill.
Golden Dawn Dairy, Delavan, Wis.
Golden Medal Dairy Products, Ocala, Fla.
Golden State Co., Ltd., San Francisco.
Goodenough's Dairy, Morrison, Ill.
Grady's Milk Company, Elkhart, Ind.
Graffenburg Dairy Company, Utica, N. Y.
Graham Milk Company, Ottumwa, Iowa.
Grand Haven Sanitary Dairy, Grand Haven, Mich.
Grand Island Creamery Company, Grand Island, Neb.
Grant-Patten Milk Co., Chattanooga, Tenn.
Grbac Dairy, De Pue, Ill.
Greenleaf Dairy, Inc., Petersburg, Va.
Greenville Dairy Company, Greenville, Pa.
Greenville Sanitary Dairy, Greenville, S. C.
Gridley's Dairy, Three Oaks, Mich.
Griffin's Dairy, Clinton, Ill.
Grim's Dairy, Mt. Carrol, Ill.
Grove Dairy, Urbana, Ohio.
Guilford Dairy Cooperative Association, Greensboro, N C.
Gustafson Ice Cream & Dairy Co., Rice Lake, Wis.
Guyan Creamery Company, Huntington, W. Va.
I. N. Hagan, Greensburg, Pa.
Handy's Sanitary Dairy, Greencastle, Ind.
Happyday Farm, Brooksville, Fla.
Harris Cream Top Milk Company, Houston, Texas.
Haybeck's Dairy, Jefferson, Wis.
Haynes' Dairy, Lincolnton, N. C.
Hazle Milk and Ice Cream Company, Hazleton, Pa.
H*B Milk Company, Frankfort, Ky.
Herold's Dairy, Butler, Pa.
Hicks Dairy, Albion, Mich.
Highland Dairies, Lakeland, Fla.
Highland Dairy Products, Hillsboro, Ohio.
Highlands Dairy, Hastings, Mich.
Hitchcox Dairy, Union City, Mich.
Hoffman's Dairy, Monroe, Mich.
Hoffman's Dairy, Sycamore, Ill.
Holt Dairy, Decorah, Iowa.
Home Town Dairy, Columbia, Pa.
Hospital Dairy Farm, Temple, Texas.
Huffman Creamery Products, Tippecanoe City, Ohio.
Hunkydory Dairy, Mendota, Ill.
Hutchinson Dairy, Hutchinson, Minn.
Hydrox Dairy, Inc., Olean, N. Y.
Hy-Grade Dairy Products, Crawfordsville, Ind.
Ideal Pure Milk Company, Owensboro, Ky.; Evansville, Ind.
Indiana Dairy Marketing Assn., Muncie, Ind.
Indianola Creamery, Indianola, Iowa.
Inverness Dairy, Cheboygan, Mich.
Ionia Creamery Company, Inc., Ionia, Mich.

Iowana Farms, Davenport, Iowa.
Janesville Pure Milk Co., Inc., Janesville, Wis.
Jersey Dairy, Spencer, Iowa.
Jerseydale Farms, Ft. Lauderdale, Fla.
Jersey Pride Creamery Co., El Dorado, Kan.
Jo-Mar Dairy, Newton, Kan.
Jo-Mar Dairies Company, Salina, Kan.
Jones & Sons Dairy, Syracuse, Ind.
Joppe's Dairy, Grand Rapids, Mich.
Kaiser Dairy Company, Paola, Kan.
Kalmia Dairy, Inc., Hendersonville, N. C.
Kanawha Dairy Company, Point Pleasant, W. Va.
Product also distributed by Meig's Star Dairy, Middleport, W. Va.
Keating Creamery Company, Yankton, S. D.
Kellner & Son Dairy, Rensselaer, Ind.
Kennedy's Dairy, Mt. Pleasant, Iowa.
Kentucky Dairies, Inc., Louisville, Ky.
Kenwood Dairies, Inc., Burlington, Vt.
Kern Dairy, Constantine, Mich.
Kiest Dairy Company, Paxton, Ill.
J. R. Kinnett Ice Cream Co., Columbus, Ga.
Knisely Dairy, Dover, Ohio.
Koester's Dairy, Effingham, Ill.
Lake Geneva Modern Dairy, Inc., Lake Geneva, Wis.
Lake Mills Dairy, Lake Mills, Wis.
Lakemont Dairy, Winter Park, Fla.
Lakeside Dairy, Inc., Sioux Falls, S. D.
Lake View Dairy, Cudahy, Wis.
Lakeview Creamery, Colon, Mich.
Lake Wales Dairy, Lake Wales, Fla.
Land-O-Lakes Creamery Co., Inc., Minneapolis. Product distributed by branch at Olivia, Minn.
Land O'Sun Dairies, Inc., Miami Beach, Fla.
Landwehr Dairy, Jefferson City, Mo.
Langenfeld Dairy Products Co., Watertown, S. D.
Lang's Creamery, Buffalo, N. Y.
Lansing Dairy Company, Lansing, Mich. (Whole Milk.)
Larson's Guernsey Dairy, Chickasha, Okla.
Laurel Springs Dairy Farm, Marion, Va.
Lawrence Sanitary Milk & Ice Cream Co., Lawrence, Kan.
Lehrack-Ferguson Dairy Products Co., Wichita Falls, Texas.
Lemke Milk Products Company, Wausau, Wis.
Liberty Ice Cream and Dairy Co., Big Rapids, Mich.
Lierman Dairy Company, Urbana, Ill.
Linger Light Dairy, Newcastle, Pa.
Little Dairy, Hanover, Pa.
Little Dairy, Ironwood, Mich.
Lockwood Dairy, Plainfield, Ill.
Locust Hill Farm Dairy, Walden, N. Y.
Lone Pine Dairy, Richland Center, Wis.
Lorain Creamery, Lorain, Ohio.

Loud & Jackson Dairies, Inc., Jackson, Mich. (Whole Milk.)

H. H. Luedeke Dairy Company, Cincinnati.

Ludwig-Lane Dairy Company, Toledo, Ohio.

Lyle's Modern Dairy, Dowagiac, Mich.

Madison County Dairy, Fredericktown, Mo

Magic City Ice and Milk Company, Endicott, N. Y.

Malec & Marek Dairy, Cleveland, Ohio.

Malloy's Dairy, Shenandoah, Pa.

Manchester Dairy, Manchester, Iowa.

Maple City Dairy, Monmouth, Ill.

Maple City Dairy, Paw Paw, Mich.

Maple Leaf Farms, Fairfield, Maine.

Maplewood Dairy, Charlevoix, Mich.

Marigold Dairies, Inc., Rochester, Faribault, Owatonna and Red Wing, Minn.

Martinsville Creamery Company, Martinsville, Va.

Massey Dairy, Inc., Granite City, Ill.

Mayfield Dairy Products Co., Mayfield, Ky.

McCausland's City Dairy, Carrollton, Ohio.

Meadow Brook Farm Dairy, Mt. Pleasant, Pa.

Meadow Dairies, Leaksville, N. C.

Meadow Gold Dairies, Inc., Kittanning, Pa.

Meadow Gold Dairy, Matteson Division Beatrice Creamery, Matteson, Ill.

Meander Dairy, Mineral Ridge, Ohio.

Melville Dairy, Burlington, N. C.

Merkle Dairy Company, Kalamazoo, Mich.

Merrill Dairy, Palatka, Fla.

Merrill View Dairy, Merrill, Wis.

Meyers Dairies, Ambler, Pa.

Meyer's Dairy, Niagara, Wis.

Midwest Creamery Company, Ponca City, Okla.

Mid-West Dairy Products Co., Inc., Rochester, Minn. Product distributed by branches at Cairo, Centralia, Mt. Carmel, Murfreesboro and Pana, Ill., Cape Girardeau and Poplar Bluff, Mo., Jackson, Tenn.

J. M. Miller Dairy Products Company, Metropolis, Ill.

Miller Brother's Dairy, Millersburg, Pa.

Miller-Reed Dairy, Shippensburg, Pa.

Miller-Yarling Dairy, Shelbyville, Ind.

Model Dairy, Huron, S. D.

Model Dairy, Wautoma, Wis.

Model Dairy, Waukon, Iowa.

Model Dairy, Inc., Mankato, Minn.

Model Milk & Ice Cream Co., Terre Haute, Ind.

Monroe Dairy, East Stroudsburg, Pa.

Mount Vernon Dairy, Charleston, W. Va.

Mount Vernon Dairy Co., Inc., Irvington, N. J.

Mt. Desert Island Dairies, Inc., Bar Harbor, Maine.

Muller's Union Dairy Co., Rockford, Ill.

Mumper's Dairy, Elizabethtown, Pa.

Muskegon Heights Dairy, Muskegon Heights, Mich.

Nansemond Cooperative Dairy, Inc., Suffolk, Va.

Nash Dairy, Reed City, Mich.
Natoma Farm, Hinsdale, Ill.
Nelson Sanitary Dairy, Red Oak, Iowa.
New Buffalo Dairy, New Buffalo, Mich.
New Ice Cream & Milk Co., Lewisburg, Tenn.
Niles Creamery Company, Niles, Mich.
Nokomis Dairy, Nokomis, Fla.
Northampton Sanitary Dairy, Northampton, Pa.
Product also distributed by Northampton Sanitary Dairy, Allentown, Pa.
Northern Dairy Company, Ishpeming, Mich.
North Heights Dairy, E. Palestine, Ohio.
North Side Dairy, Dodgeville, Wis.
Oak Glen Dairy, Stillwater, Minn.
Oakland Dairy, Pontiac, Mich.
Oatman Brothers, Inc., Aurora, Ill.
Ohio Valley Dairy, New Concord, Ohio.
Old Meadow Creamery Company, Cleveland.
Old Mill Dairy, Elizabethtown, Ky.
Olmstead & Sons, Coldwater, Mich.
Olson Dairy, Portland, Ind.
Page Homestead Farm, Keene, N. H.
Paris Dairy Products Co., Paris, Tenn.
Parkersburg Creamery Company, Parkersburg, W. Va.
Parks Dairies, Camden, N. J.
Parkside Dairy Company, Elgin, Ill.
Parkway Dairies, Bradford, Pa.
Pasturite Dairy, Mt. Morris, Ill.
Peerless Dairy Company, Rock Island, Ill.
Perryland Farm, Perry, Fla.
Peshtigo Dairy Company, Marinette, Wis.
Frank Petelinz Dairy, Newburgh, N. Y.
Peters Dairy, Michigan City, Ind.
Petersburg Creamery Company, Petersburg, Ohio.
Pettigrew and Co., Inc., Fayetteville, Ark.
Pinecrest Dairy, Council Bluffs, Iowa.
Pioneer Dairy, Inc., Harrodsburg, Ky.
Pittsfield Milk Exchange, Pittsfield, Mass.
Pleasant Street Dairy, Watervliet, Mich.
Powell Dairy Company, Meadville, Pa.
Pope's Dairy, Merrill, Wis.
Prairie Dairy Products Co., Prairie du Chien, Wis
Prairie View Dairy, East Chicago, Ind.
Probst Milk Company, Aurora, Ind.
Producers Cooperative Dairy, Quincy, Ill.
Producers Creamery, Benton Harbor, Mich.
Producers Creamery, Olney, Ill.
Producers Dairy, Inc., Jacksonville, Ill.
Pure Milk Dairy, Muscatine, Iowa.
Purity Dairy, Beloit, Ohio.
Purity Dairy, Union City, Ind.
Purvin Dairy Company, Wilkes-Barre, Pa.

Qualitee Dairy Products Co., San Diego, Calif.
Quality Dairy, Gloversville, N. Y.
Quality Dairy, Nevada, Iowa.
Quality Dairy Company, Hannibal, Mo.
Quality Dairy, Inc., St. Cloud, Minn.
Quality Dairy, Geneseo, Ill.
Quality Dairy, Princeton, Wis.
Quality Dairy Products, Inc., Lynchburg, Va.
Quality Milk Products Company, Tulsa, Okla.
Queen City Dairy, Inc., Cumberland, Md.
Queen Dairy, Lancaster, Pa.
Quiver Side Dairy, Havana, Ill.
Rainbo Dairy, Clinton, Iowa.
Reading Dairy, Reading, Pa.
Reddy Dairy, Pecatonica, Ill.
Reed Milk & Ice Cream Company, Shamokin, Pa.
Renova Milk Products, Renova, Pa.
Rice Dairy, Benzonia, Mich.
Ridgehurst Dairy, Fort Atkinson, Wis.
Ridley's Dairy, Estherville, Iowa.
Rimac Dairy Products, Inc., Fairfield, Iowa.
Rittman Dairy, Rittman, Ohio.
Riverdale Supreme Dairies, Salamanca, N. Y.
Riverside Dairy, Mishawaka, Ind.
Riverview Dairy, Ord, Neb.
Riviera Dairy Creamery, Santa Barbara, Calif.
Rolling Green Dairy, Scottsburg, Ind.
Rosebud Creamery Company, Detroit.
Rose Lawn Dairy, Muskogee, Okla.
Rosenberger Dairy Products Co., Wellsville, Ohio.
Roseville Creamery Co., (P. O. Mt. Clemens, Mich.), Roseville, Mich.
Ross Dairy Corporation, Manistee, Mich.
Roum Dairy, Sun Prairie, Wis.
Rubart's Dairies, Vineland, N. J.
Ruff's Dairy, St. Clair, Mich.
Ryder's Dairy, Inc., Lemoyne, Pa.
St. John's Dairy, St. John's, Mich.
St. Paul Milk Company, St. Paul, Minn.
Samson Farm Dairy, Buchanan, Mich.
Sanitary Dairy, Watseka, Ill.
Sanitary Milk Company, Rantoul, Ill.
Sanitary Dairy, Plymouth, Ind.
Sanitary Dairy, Winchester, Va.
Schellpfeffer's Dairy, Mayville, Wis.
Schemmel Bros. Quality Dairy, Sidney, Ohio.
Schiefelbein Dairy, Edgerton, Wis.
High Scott & Son Dairy, Northport, Mich.
Searles Dairy, Cedar Rapids, Iowa.
Sebree Dairy, Canton, Ill.
A. I. Shears, Otsego, Mich.
Shmidt Dairy, Monticello, Iowa.

Sheboygan Dairy Products Company, Sheboygan, Wis. The product is distributed under the name of Verifine Dairy Products Co.

Shoreland Farm Dairy, Oconomowoc, Wis.

Silver Crest Dairies, San Bernardino, Calif.

Sirrine Dairy, Midland, Mich.

Smith Dairy Company, Garfield Heights, Cleveland.

Smith's Creamery, Salem, Ohio.

A. B. Snyder & Son, Middlesboro, Ky.

Soldwedel Dairy Co., Pekin, Ill.

South St. Paul Dairies, Inc., South St. Paul, Minn.

Southwest Utility Dairy Products Co., Oklahoma City.

Springdale Dairy, Duluth, Minn.

Squire Ice Cream Co., Shenanedah, Iowa.

Standard Dairy Company, Freeport, Ill.

Steffen Ice & Ice Cream Co., Arkansas City and Wichita, Kan.

Staunton Dairy, Staunton, Ill.

Stephens Brothers, Carbondale, Pa.

Sterling Milk Company, Inc., Erie, Pa.

Stoco Dairy, Carmi, Ill.

Stowell's Dairy, LeRoy, N. Y.

Sullivan Milk Products, Battle Creek, Mich.

Sunbeam Dairy Company, Perry, Iowa.

Sunbury Milk Products Co., Sunbury, Pa.

Sunlit Dairy, Goshen, Ind.

Sunlite Dairy Company, Oshkosh and Eau Claire, Wis.

Sunrise Dairy, Gastonia, N. C.

Sunshine Farms, Lafayette, Ind.

Superior Dairy, Canton, Ohio.

Superior Dairy Company, Newton, Iowa.

Sweet Clover Dairy, East Grand Forks, Minn.

The Sycamore Dairy, Haines City, Fla.

Terry Dairy Company, Little Rock, Ark.

Tews Dairy, Cedarburg, Wis.

Thayer Dairy, Inc., Clare, Mich.

Thayer's Dairy, Delphi, Ind.

Thomas Dairies, Flourtown, Pa.

Topaz Dairy, Hastings, Neb., also known as Blue Valley Creamery.

Trask River Dairy, Tillamook, Ore.

Traymor's Dairy, Louisiana, Mo.

Trevitt Co-operative Association, Inc., Blasdell, N. Y.

Twin Cities Dairy, French Lick, Ind.

U. C. Milk Company, Madisonville, Ky.

The United Dairy Company, Wheeling, W. Va.

United Dairies Corporation, McPherson, Kan.

United Dairy Products Co., Huntsville, Ark.

Valley Dairy Company, East Pittsburgh, Pa.

Valley Home Dairy, Leadville, Col.

Valparaiso Home Ice Company, Valparaiso, Ind.

Vandalia Dairy Co., Vandalia, Ill.

Virginia Dairy Company, Richmond, Va.

Walnut Bank Farms, Quakertown, Pa.

Sydney Wanzer & Sons, Inc., Chicago.
Warminster Farms Dairies, Inc., Hatboro, Pa.
Warren County Dairy Association, Warren, Pa.
Warren Sanitary Milk Company, Warren, Ohio.
Washington Dairy, Washington, Iowa.
Weber Dairy Company, Joliet, Ill.
Weir-Cove Dairy, Hollidays Cove, W. Va.
Weisser Dairy, W. Des Moines, Iowa.
Wendt's Dairy, La Salle, N. Y.
West End Dairy, Charleston, S. C.
Westfall Dairy, Port Jervis, N. Y.
Westland Farm, Mt. Holly, N. C.
Westleigh Farm Dairies, Windsor, Vt.
White Dairy, Oxford, Ind.
White House Creamery, Keokuk, Iowa.
Williamsport Milk Products Co., Inc., Williamsport, Pa.
Willow Creek Dairy, St. Clairsville, Ohio.
Wilmerink Dairies, Inc., Cleveland.
Wilson Dairy Company, Atlantic City, N. J.
Windham County Cooperative Milk Producers, Brattleboro, Vt.
Winona Milk Company, Winona, Minn.
Wisconsin Valley Creamery Company, Wisconsin Rapids and Stevens Point, Wis.
Witherson's Dairy, Hautzdale, Pa.
Woodlawn Farms Dairy, Kirkwood, Mo.
Woodsfield Ice and Cream Co., Woodsfield, Ohio.
Woodward Dairy Products, Woodward, Okla.
Wright's Dairy, Marseilles, Ill.
Zion Industries, Dairy Division, Zion, Ill.

The following firms distribute under their own labels Krim-Ko Chocolate Flavored Drinks which are bottled by manufacturers of accepted Krim-Ko Chocolate Flavored Drinks. The labels and advertising conform to the Council Rules and Decisions.

Gallipolis Dairy, Gallipolis, W. Va.

MILK FORTIFIED WITH VITAMIN D

Milk Fortified with Cod Liver Oil Preparations

VITEX

Milk

Pasteurized milk containing 400 U. S. P. units of vitamin D per quart; bottled and distributed by the following firms stand accepted:

Aces Pure Milk Co., Fort Smith, Ark.
Acme Dairy Products Co., Massillon, Ohio.
Amsterdam Dairy, Schenectady, N. Y.
Aristocrat Dairy Products Company, Atlanta, Ga.
Avondale Dairy Co., Cincinnati.
Avondale Farms Creamery, Inc., Knoxville, Tenn.

Avondale Farms Dairy, Inc., Bethlehem, Pa. (Skimmed Milk and Grade B Whole Milk.)

Babybrand Dairy, Fort Wayne, Ind.

Baker-Stuber Dairy Company, Peoria, Ill.

Baldwin Dairies, Inc., Philadelphia. (Grades A and B.)

Banquet Ice Cream & Milk Company, Indianapolis.

Beatrice Creamery Company, Dubuque, Iowa.

Henry Becker & Son, Inc., Roseland, N. J. (Grade A.)

Beechmont Dairy, Inc., Bridgeport, Conn.

J. A. Bergren Dairy Farms, East Hartford, Conn.

G. H. Berling, Inc., Cincinnati.

Best-Ever Dairy Products Co., New Castle, Ind.

Bissell's Dairy, Holyoke, Mass. (Grade B.)

Blue Hen Farms, Wilmington, Del. (Grade B.)

Blue Ribbon Creamery, Jackson, Miss., also distributed by Ness Creameries, Biloxi, Miss.

Blue Ribbon Dairy Company, Inc., Gary, Ind.

The Borden Company, New York.
Product distributed by Collar City Creamery, Troy, N. Y.

Borgeson Brothers Dairy Co., Waterbury, Conn.

Boswell Dairies, Fort Worth, Texas. (Grade A, 4% butterfat; Jersey Grade A, 4.5% butter fat; Holstein Grade A, 3.5% butterfat.)

Bridgeman-Russell Company, Duluth, Minn.

Brock-Hall Dairy Company, New Haven, Conn.

J. H. Brokhoff, Inc., Pottsville, Pa.

Wm. J. Burbeck Co., Lowell, Mass.

Campbell's Dairy Products, Peterborough, Ont., Canada.

Central Dairy Products Company, Oklahoma City. (Grade A.)

Charlotte Dairies, Inc., Charlotte, N. C.

Chestnut Farms-Chevy Chase Dairy, Washington, D. C.

Chicago Guernsey Farm, Inc., Hinsdale, Ill.

Cline Ice Cream Company, Charleston, W. Va.

The Clover Dairy Company, Wilmington, Del.

Cloverdale Farms Co., Inc., Binghamton, N. Y.

Clover Hill Farms, Inc., Fitchburg, Mass.

Cloverland Dairy Products Co., Inc., New Orleans.

Cloverleaf Creamery, Inc., Troy, N. Y. *See* Dairymen's League Cooperative Association, New York.

Cloverleaf Dairy Co., Gary, Ind.

Collar City Creamery, Troy, N. Y. *See* The Borden Company, New York.

Columbia Dairies, Columbia, S. C.

Carl Colteryahn Dairy, Pittsburg.

The Consumers Dairy Company, Toledo, Ohio.

The Coors Brothers Company, Cincinnati.

Country Creamery, Milwaukee (also known as Jersey Dairies). *See* Sunshine Dairy Co., Milwaukee.

County Dairy Co., Clayton, Mo.

Crowley's Milk Company, Inc., Binghamton and Newburgh, N. Y.

B. L. Cummings, Arlington, Mass.

Curles Neck Farm, Richmond, Va.

Dairy Distributors, Inc., Milwaukee.

Dairyland Milk Company, Dallas, Texas.

Dairymen's League Co-operative Association, Inc., New York. Product is bottled and distributed by branches at Auburn, Liberty, Poughkeepsie and Syracuse, N. Y., and by Wm. Weckerle & Sons, Inc., Buffalo.

Product bottled at Auburn, N. Y., also distributed by a branch at Hackensack, N. J.

Product bottled at Poughkeepsie also distributed by branches at Catskill, Hudson, Kingston and Harrison, N Y.

Dairy Specialties, Inc., Chicago.

Deary Bros., Inc., Webster, Mass.

Deerfoot Farms Co., Southboro, Mass.

Dellwood Dairy Co., Inc., Yonkers, N. Y. (Grade B.)

Delong's Dairy, Glens Falls, N. Y.

Detroit Creamery Company, Pontiac, Mich. (Pontiac Branch.)

Detroit Pure Milk Company, Detroit.

Dewhirst Dairy, Bridgeport, Conn. (Grades A and B.)

Diamond Milk Products, Incorporated, Columbus, Ohio. Product also distributed by Independent Milk Company, Columbus, Ohio.

Diamond State Dairies, Inc., Dover, Del.

Dighton Rock Farm, Dighton, Mass.

Dinsmore Dairy Co., Jacksonville, Fla. (Dinsmore Dairy Golden Guernsey Grade A and Dinsmore Dairy Grade A.)

Dixie Dairies, Macon, Ga.

Dixie Dairy Company, Gary, Ind.

Dixon Dairy, Galt, Ontario, Canada.

Downing Bros. Dairy, Rock Island, Ill.

Drew's Dairy, Augusta, Maine.

East Side Jersey Dairy Co., Anderson, Ind.

Edgemar Farms, Venice, Calif.

Eisenhart's Dairy, York, Pa.

El-Cor Dairies, Inc., Elmira, N. Y.

E. H. Elton Dairy, Bristol, Conn.

Emmadine Farms, Inc., Beacon, N. Y.

Oscar Ewing & Sons, Louisville, Ky.

Ewing-Von Allmann Dairy, Louisville, Ky.

Fairfax Farms Dairy, Inc., Washington, D. C.

Fall River Dairy Co., Fall River, Mass.

Farmers Creamery Co., Inc., Fredericksburg, Va.

Ferndale Dairy, Inc., Kensington, Conn. (Grades A and B.)

Ferndale-Nelson Creamery, Jamestown, N. Y.

Fernwood Farms Dairy, Inc., Waterbury, Conn. (Grade A.)

The J. H. Fielman Dairy Company, Cincinnati.

Florida Dairies Company, Miami, Fla.

The Flynn Dairy Company, Des Moines, Iowa.

Foremost Dairies, Inc., Jacksonville, Fla.

Fort Dodge Creamery Co., Fort Dodge, Iowa.

J. A. Frear & Sons, Dover, Del.

The Freeman Company, Flint, Mich.

Freeman's Dairy, Allentown, Pa.

French-Bauer, Inc., Cincinnati.

Garden State Dairies, Millville, N. J.

Garst Bros. Dairy, Inc., Roanoke, Va

General Ice Cream Corporation, Schenectady, N. Y.

General Ice Cream Corporation, Springfield, Mass. (Cream Crest Grade A and Cream Crest Family.)

Gillette Dairy, Norfolk, Neb.

Golden Rule Bakery and Dairy, Snoqualmie, Wash.

Granite Farm Dairy, Brunswick, Maine. (Grade A)

Greensboro Creamery Dairy, Greensboro, N. C. *See* Pet Dairy Products Company, Johnson City, Tenn.

Greens Dairy, York, Pa.

Green Vale Milk Company, Nashville, Tenn.

Greenville Sanitary Dairy, Greenville, S. C.

Guernsey Dairy Company, Oshkosh, Wis.

Guilford Dairy Cooperative Assn., Inc., Greenboro, N. C.

I. N. Hagan Ice Cream Company, Uniontown, Pa.

Hagerstown Dairy Company, Hagerstown, Md.

Hamilton Dairy Company, Chicago.

Harbison's Dairies, Inc., Philadelphia.

Harvey Dairy, Inc., Hyattsville, Md.

Hawthorn Melody Farms Dairy, Highland Park, Ill. (Grade A and Guernsey Grade A.)

Hazel's Dairy, Falls Church, Va.

Heatherwood Farms Co., Lansing, Mich.

Heep Dairy Products, Austin, Texas.

Herlihy Bros., Inc., Somerville, Mass.

The Highland Dairy Company, Hartford, Conn. (Golden Jersey Grade A and Grade B.)

Highland Dairy Farms Co., St. Louis, Mo. (Grade A and Commercialized.)

Hiland Dairy Company, Newport, Ky.

W. E. Hoffman Company, Altoona, Pa.

Holyoke Producers Dairy Co., Inc., Holyoke, Mass.

Home Dairy, Lancaster, Ohio (Regular Grade).

Hutchison Dairy, Galt, Ontario, Canada.

Hutts' Dairy, Buffalo, N. Y.

The Hyde Park Dairy Company, Cincinnati.

Ideal-Pure Milk Co., Evansville, Ind.

The Isaly Dairy Co., Youngstown and Canton, Ohio. *See* Diamond Milk Products, Incorporated, Columbus, Ohio.

Janssen Dairy Corporation, Hoboken, N. J.

Jersey Creamline Dairies, Milwaukee. *See* Sunshine Dairy Company, Milwaukee.

Jersey Dairies, Milwaukee. *See* Sunshine Dairy Company, Milwaukee.

Jersey Milk Company, Portland, Ore.

Jersey Milk Service, Inc., Worcester and Springfield, Mass.

Johnson Creamery, Wyandotte, Mich.

Johnstown Sanitary Dairy Co., Johnstown, Pa.

Kaeśemeyer & Sons Co., Cincinnati.

Kahmann and Rehkamp Co., Covington, Ky.

Kelly's Dairies, Inc., Beaumont, Texas.

W. J. Kennedy Dairy Company, Detroit.

Kligerman Dairies, Inc., Atlantic City, N. J.

Lakeview Dairy, Inc., Richmond, Va.

Lawrence Sanitary Milk & Ice Cream Co., Lawrence, Kan.

Layton Park Dairy Company, Milwaukee.
Lemke Milk Products Co., Wausau, Wis.
Lincoln Dairy Company, Hartford, Conn.
Lone Star Creamery Co., Houston, Texas.
H. H. Luedeke Dairy Co., Cincinnati.
Frank Lyons Dairy, Mt. Carmel, Pa. (Grade B)
J. F. McAdams & Bros., Chelsea, Mass. (Grade B)
Magic City Ice & Milk Company, Endicott, N. Y.
John C. Mandery & Son, Cincinnati.
Maplehurst Dairy Co., Stamford, Conn.
Marigold Dairies, Inc., Rochester and Winona, Minn.
Mari Gold Diary, Racine, Wis.
Marshall Dairy Co., Inc., Ithaca, N. Y.
Matthews Frechtling Dairy Co., Cincinnati.
Meadow Lark Dairy, Olympia, Wash.
Med-O-Bloom Dairy, Kokomo, Ind.
Merrill Dairy, Palatka, Fla.
Merrill Haven Farm, Auburn, Me.
Meyers Dairies, Ambler, Pa. (Grade A and Grade B)
Micheel Dairy Company, Davenport, Iowa.
Michigan Farmers Dairy, Detroit.
Middletown Milk & Cream Co., Middletown, N. Y. Product distributed by Middletown Milk & Cream Co., Slate Hill, N. Y. (Cream-rich and Grade B.)
Midvale Farm, Moline, Ill.
Midwestern Dairy Products Co., Salt Lake City.
H. Miller Dairy Company, Cincinnati.
R. G. Miller & Sons, Inc., Hartford, Conn.
Mishawaka Farms Dairy Co., Mishawaka, Ind.
Moore Bros. Company, Meadville, Pa.
Nadler Bros., Amsterdam, N. Y.
Ness Creameries, Biloxi, Miss. *See* Blue Ribbon Creamery, Jackson, Miss.
Norris Creamery, Inc., Norris, Tenn.
Ockenden Dairy, Auburn, N. Y.
Paulus Dairy, New Bruswick, N. J. (Grade A.)
Peerless Dairy, Ltd., Windsor, Ontario, Canada.
Penn-Cress Ice Cream Company, Inc., Cresson, Pa.
Penn Dairies, Inc., Lancaster, Pa.
Pet Dairy Products Company, Johnson City, Tenn. Product distributed by branch known as Greensboro Creamery Dairy, Greensboro, N. C.
Pet Milk Company, St. Louis. *See* Pet Dairy Products Company, Johnson City, Tenn.
A. C. Petersen Farms, Inc., W. Hartford, Conn.
Pevely Dairy Company, St. Louis.
The Phenix Dairy, Houston, Texas.
Philadelphia Quaker-Maid Milk Co., Philadelphia.
Phillips' Dairy Company, Decatur, Ill.
Pineview Dairy, Raleigh, N. C.
Pittsfield Milk Exchange, Pittsfield, Mass.
Prairie View Dairy Company, East Chicago, Ind.
Producers Dairy System, Inc., Nashua, N. H.

Purity Maid Products Company, New Albany, Ind.

Purity Milk Products, Smith's Falls, Ontario, Canada.

Purvin Dairy Company, Wilkes-Barre, Pa.

Quachita Dairy Dealers Cooperative Assn., Inc., Monroe, La.

Quality Dairy, Inc., St. Louis.

Quality Dairy Products Company, Salt Lake City.

Radway's Dairy, Inc., New London, Conn. (Grades A and B.)

Ranier's Cream Top Dairy, Bridgeton, N. J. (Blue Ribbon Milk.)

Reiter's Dairy Company, Chicago.

M. H. Renken Dairy Company, Brooklyn.

Renna Dairy Company, Old Forge, Pa.

Rephan's Sanitary Dairy, Charleston, S. C. (Grade A.)

The Rider Dairy Company, Danbury, Conn.

Rieck-McJunkin Dairy Company, Pittsburg. (Grade A, 4.3% butterfat), **Charleroi, Pa.**, (Grade B), **New Castle, Pa.**, (Grade B) and **Butler, Pa.**, (Grade B.)

Roanoke Dairy & Ice Cream Co., Inc., Roanoke, Va.

Roberts Dairy Company, Omaha; Sioux City, Iowa; Lincoln, Neb.

Round Top Farms, Damariscotta, Maine. (Grade A.)

J. D. Roszell Company, Peoria, Ill.

Round Hill Farms, Greenwich, Conn. (Grade A and Grade B.)

Royal Crest Milk, Inc., Denver.

Ruster Dairy Company, Grand Rapids, Mich.

Sagal Farms, Inc., Branford, Conn.

Sagal-Lou Products Co., Inc., New Haven, Conn.

St. Louis Dairy Company, St. Louis. (Grade A and Commercial.)

Salt Lake Milk Producer's Association, Salt Lake City.

Sanford's Overlook Farms Dairy Company, Waterbury, Conn.

Sanitary Dairies Co., Eureka, Calif.

Sanitary Farm Dairies, Inc., Houston, Texas.

Sapulpa Creamery, Sapulpa, Okla.

Schwab's Dairy, Peoria, Ill.

Sefcik Dairy Co., Chicago.

Shannon's Dairy, Jeffersonville, Ind.

Sheffield Farms Company, Inc., New York. (Grades A and B.)

C. E. Smith & Son, Inc., New Haven, Conn.

Southern Dairies, Inc., Jacksonville, St. Petersburg and W. Palm Beach, Fla.; Asheville, Rocky Mount, Wilson and Winston-Salem, N. C.; Knoxville, Tenn.; Atlanta, Ga.

Southwest Dairy Products Company, San Antonio, Wichita Falls and Fort Worth, Texas.

Stearns Dairy Company, Denver.

Sterling Milk Products Co., Oklahoma City.

Sturtevant Ice Cream Company, Rock Island, Ill.

Summe & Ratermann Co., Inc., Covington, Ky.

Sunbury Milk Products Co., Sunbury, Pa.

Sunset Dairy Co., Tucson, Ariz.

Sunshine Dairies, Utica, N. Y.

Sunshine Dairy Company, Milwaukee.

Product distributed by Jersey Dairies (also known as Country Creamery), Milwaukee, and Jersey Creamline Dairies, Milwaukee.

Superior Dairy Company, Davenport, Iowa; Tacoma, Wash.

Supplee-Wills-Jones Milk Co., Philadelphia. (Grades A and B.)

The Telling-Belle Vernon Company, Cleveland.

Uecke Dairy Company, Eau Claire, Wis.

Union Dairy Company, Chicago.

United Dairy System, Inc., Springfield and Worcester, Mass. (Grades A and B.)

Virginia Dairy Company, Inc., Richmond, Va.

Vitex Laboratories, Des Moines, Iowa; Waukegan, Ill.

Walnut Grove Dairy, Alton, Ill.

Weber Central Dairy Association, Inc., Ogden, Utah.

Wm. Weckerle & Sons, Inc., Buffalo. *See* Dairymen's League Cooperative Association, New York.

Wehr Dairy, Inc., Hamilton, Ohio.

Welsh Farms, Inc., Long Valley, N. J.

Wendt's Cream Top Dairy, La Salle, N. Y.

Westover Dairy, Inc., Lynchburg, Va.

White Eagle Dairy Company, Chicago.

C. J. Wieland & Son, Inc., Chicago.

Williamsport Milk Products Co., Inc., Williamsport, Pa.

Willow Farm Products, La Grange, Ill.

Willson Dairy Products, Cincinnati. (Grade A.)

Wilson Dairy Company, Atlantic City, N. J.

Woodlawn Farm Dairy Company, Wilkes-Barre and Scranton, Pa.

Woodmont Dairy Co., Deer Park, Ohio.

R. F. Worden & Sons, Waterbury, Conn. (Grades A and B.)

York Sanitary Milk Company, York, Pa.

Young's Dairy Company, Inc., Sioux City, Iowa.

L. C. Young Ice Cream Company, Montgomery, Ala. (Grade A.)

Pasteurized milk containing 400 U. S. P. units of vitamin D per quart, bottled by manufacturers of accepted vitamin D fortified milk products are distributed under their own labels by the following firms. The labels and advertising conform to the Council Rules and Decisions.

Baumann Dairy Co., Milwaukee.

H. S. Chardavoyne, Inc., Brooklyn.

Dellwood Dairy, Inc., Yonkers, N. Y. (Cream-rich Brand vitamin D Vitex Milk.)

Inwood Farms, Inc., Harrison, N. Y.

Jersey Creamery Company, Detroit.

Kentucky Dairies, Inc., Louisville, Ky.

Korts Dairy Products Co., Rochester, N. Y.

Lakeview Dairy, Cudahy, Wis.

Mid-Western Dairy Products Co., Ogden, Utah.

Miller's White Farms, Inc., Valley Cottage, N. Y.

Model Farms Dairy, Louisville, Ky.

Morrisania Stock Farms, Inc., Bronx, N. Y. (Cream-rich Brand vitamin D Vitex Milk and Grade B vitamin D Vitex Milk.)

Townsend-West Dairy, Cincinnati.

Vitex Laboratory, Minneapolis.

Homogenized Milk

Homogenized pasteurized milk containing 400 U. S. P. units of vitamin D per quart, bottled and distributed by the following firms, stand accepted:

Aines Farm Dairy Co., Kansas City, Mo.
Akron Pure Milk Co., Akron, Ohio.
Alfar Creamery Company, W. Palm Beach, Fla.
Anthony Pure Milk Company, Nashville, Tenn.
Aristocrat Dairy Products, Inc., Atlanta, Ga. (Certified.)
Avondale Farms, Knoxville, Tenn.
Babcock Dairy Co., Toledo, Ohio.
Babcock's Dairy Company, Port Huron, Mich.
Baker-Hubbell Dairy, Inc., Peoria, Ill.
Baker's Dairy, Moline, Ill.
Bartholomay Company, Inc., Rochester, N. Y.
Bauer Dairy, Elyria, Ohio.
Braley's Creamery, Inc., New Bedford, Mass.
Brock-Hall Dairy Company, Inc., New Haven, Conn. (Grade D.)
J. H. Brokhoff, Inc., Pottsville, Pa. (Grade B.)
Wm. J. Burbeck Co., Lowell, Mass.
The Canton Pure Milk Co., Canton, Ohio.
Chapman Dairy, Kansas City, Mo.
Chestnut Farms-Chevy Chase Dairy, Washington, D. C.
County Dairy Co., Clayton, Mo. (Grade A.)
Columbia Dairies, Columbia, S. C. (Grade A.)
Conneaut Creamery Company, Conneaut, Ohio.
Crystal Dairy Products Company, Marietta, Ohio.
Dairyland, Inc., San Antonio, Texas. *See* Southwest Dairy Products Co., San Antonio, Texas.
Dairymen's Milk Co., Pittsburgh. Product distributed by The Pittsburgh Milk Co, Pittsburgh.
Dairymen's League Co-Operative Association, Inc., Syracuse, N. Y.
Dairymen's Ohio Farmers Co-operative Association, Cleveland.
O. A. Dean Dairy Co., Cleveland Heights, Ohio. (Dean's Homogenized and Class 1 Homogenized Vitamin D Milks.)
Deary Bros., Inc., Webster, Mass.
Decker's Dairy, Hightstown, N. J. (Grades A and B.)
The Defiance Dairy Company, Defiance, Ohio.
Devine's Milk Co., Taunton, Mass. (Family Grade.)
Dinsmore Dairy Co., Jacksonville, Fla. (Grade A.)
Downing Brothers Dairy, Rock Island, Ill.
East End Dairy Co., Harrisburg, Pa.
Ewing-Van Allmen Dairy Co., Louisville, Ky.
Erie County Milk Association, Erie, Pa. (Grade B.)
Ferndale Dairy, Inc., Kensington, Conn. (Grade B.)
Fox's Guernsey Dairy, Waukesha, Wis.
Franklin Cooperative Creamery Association, Minneapolis.
Freeman's Dairy, Allentown, Pa.
Gallicker Ice Cream Company, Johnstown, Pa.
Grant-Patten Milk Company, Inc., Chattanooga, Tenn.
Greensboro Creamery Dairy, Greensboro, N. C. *See* Pet Dairy Products Company, Johnson City, Tenn.

J. E. Harshbarger Dairy, Altoona, Pa.

Harrisburg Dairies, Inc., Harrisburg, Pa.

Hawthorn-Melody Farms Dairy, Highland Park, Ill. (Grade A.)

Himes Bros. Dairy Co. Dayton, Ohio.

Hoekstra Dairy Products Co., Grand Rapids, Mich.

Hopewell Dairy, Bellefontaine, Ohio.

Horack Dairy, St. Louis.

The Ideal Dairies Co., Painesville, Ohio.

Illinois Valley Ice Cream Company, Streator, Ill.

Jersey Creamery Company, Detroit.

Kalamazoo Creamery Co., Kalamazoo, Mich.

Henry Kart, Inc., Buffalo.

Kelly's Dairies, Inc., Beaumont, Texas.

W. J. Kennedy Dairy Company, Detroit.

Koch Dairy Co., Evansville, Ind.

Lansing Dairy Company, Lansing, Mich.

Levengoods' Dairies, Pottstown, Pa.

Lone Star Creamery Co., Houston, Texas.

Lorain Creamery, Lorain, Ohio.

Louisiana Creamery, Inc., Baton Rouge, La.

Marion Pure Milk Company, Marion, Ind.

J. F. McAdams & Bros., Inc., Chelsea, Mass.

McDonald Dairy Company, Flint, Mich.

Meadow Gold Dairies, Inc., Pittsburgh.

The Meyer Dairy Products Co., Cleveland.

Mid-West Dairy Products Co., Inc., Rochester, Minn. Product distributed by Mid-West Dairy Products Co., Inc., Centralia, Ill.

Moss Farm Dairy, Inc., Chesterland, Ohio. (Sunnyside Farm Homogenized and Class 1 Homogenized Vitamin D Milks.)

Nashville Pure Milk Company, Nashville, Tenn.

Neal's Dairy Farms Co., Dayton, Ohio.

The Netherland Co., Inc., Syracuse, N. Y. (Grade A.)

Normal Sanitary Dairy, Inc., Normal, Ill. (Viscolized Vitamin D Vitex Milk.)

Old Meadow Creamery Co., Cleveland. (Old Meadow Homogenized and Class 1 Homogenized Vitamin D Milks.)

Otto's Suburban Dairy, Inc., Emsworth and Pittsburgh, Pa.

Page Dairy Co., Toledo, Ohio.

G. B. Parthemore & Sons, Inc., New Cumberland, Pa.

Peerless Dairy Company, Rock Island, Ill.

Pet Dairy Products Company, Johnson City, Tenn. Product distributed by branch known as Greensboro Creamery Dairy, Greensboro, N. C.

Pet Milk Company, St. Louis. *See* Pet Dairy Products Company, Johnson City, Tenn.

The Pittsburgh Milk Co. *See* Dairymen's Milk Co., Pittsburgh.

Plainview Farms Dairy, Louisville, Ky. (Grade A.)

Producers Co-operative Milk Association, Quincy, Ill.

Producers' Dairy Co., Brockton, Mass.

Puritan Dairy Co., Inc., Miami, Fla.

Purvin Dairy Co., Wilkes-Barre, Pa. (Grade B.)

Quality Dairy Co., Inc., St. Louis.

Rieck-McJunkin Dairy Co., Pittsburgh. (Grade B.)

Robert's Dairy Company, Sioux City and Council Bluffs, Iowa, and Lincoln and Omaha, Neb.

J. D. Roszell Company, Peoria, Ill.
St. Lawrence Dairy Co., Reading, Pa.
Sagal Lou Products Co., New Haven, Conn.
Sanitary Dairy Co., Muskegon, Mich.
Sanitary Farms Dairy, Inc., Erie, Pa.
Sanitary Farm Dairies, Inc., St. Paul, Minn. (Grade A.)
Sanitary Milk Co., Canton, Ohio.
Schneider-Bruce Dairy Co., Rocky River, Ohio.
Schwab's Dairy, Peoria, Ill.
Selected Dairies, Inc., Winston-Salem, N. C.
Shamokin Sanitary Milk Co., Shamokin, Pa.
Sheffield Farms Company, Inc., New York.
Smith's Model Dairy, Inc., Hamburg, Pa.
Southern Dairies, Inc., Knoxville, Tenn.; Winston-Salem and Asheville, N. C., and Jacksonville, Miami and West Palm Beach, Fla.
Southwest Dairy Products Co., San Antonio, Texas. Product distributed by Dairyland, Inc., San Antonio, Texas.
Clayton Stegmeier B & S Dairy, Tamaqua, Pa.
Sterling Milk, Inc., Erie, Pa.
Studey Sanitary Dairy, Racine, Wis. (Grade A.)
Sturtevant Dairy Products Co., Rock Island, Ill.
Sullivan Dairy Company, Ann Arbor, Mich.
Sullivan Milk Products, Battlecreek, Mich.
Sunshine Dairy, Inc., Framingham, Mass.
Superior Dairy, Canton, Ohio.
Superior Dairy Co., Ann Arbor, Mich.
Supreme Dairy Co., Alliance, Ohio.
The Telling Belle Vernon Company, Cleveland. (Regular, Grade A and Premier Class "1.")
Twin Pines Farm Dairy, Inc., Detroit.
United Dairies, Inc., Highland Park, Mich.
United Milk Co., New Britain, Conn.
Valley Farm Dairy Co., Inc., St. Louis.
Walnut Grove Dairy, Alton, Ill. (Grade A.)
Wm. Weckerle & Sons, Inc., Buffalo.
Wehr Dairy, Inc., Hamilton, Ohio. (Grade 1.)
Wilke Dairy Co., Milwaukee.
L. C. Young Ice Cream Company, Montgomery, Ala. (Grade A.)
Youngs Dairy, Sioux City, Iowa.
Youngstown Sanitary Milk Co., Youngstown, Ohio.

Evaporated Milk

The listed products of the following firms stand accepted:

Dean Milk Company, Chicago.

DEAN'S BRAND VITAMIN D EVAPORATED MILK, containing 400 U. S. P. units of vitamin D per 14½ ounce can.

Pevely Dairy Company, St. Louis.

PEVELY BRAND VITAMIN D EVAPORATED MILK, containing 325 U. S. P. units of vitamin D per 14½ ounce can.

Watertown Milk Cooperative, Watertown, Wis., product distributed by Dairy Distributers, Inc., Milwaukee.

DAIRY DISTRIBUTERS BRAND VITAMIN D EVAPORATED MILK, containing 325 U. S. P. units of vitamin D per 14½ ounce can.

Evaporated Vitamin D Milk, prepared by manufacturers of accepted vitamin D fortified milk products, distributed under private label brands of the following firms. The labels and advertising conform to the Rules and Decisions of the Council.

W. J. Kennedy Dairy Company, Detroit.

W. J. KENNEDY'S BRAND VITAMIN D EVAPORATED MILK, containing 400 U. S. P. units of vitamin D per 14½ ounce can.

CLO-DEE

Milk

Pasteurized milk containing 400 U. S. P. units of vitamin D (supplied by Clo-Dee in concentrated milk) per quart, bottled and distributed by the following firms, stand accepted:

Garden State Farms, Inc., Midland Park, N. J. (Grades A and B).

Metzger Dairies, San Antonio, Texas.

Model Farms Dairy, Washington, D. C.

Evaporated Milk

The listed products of the following firms stand accepted:

Morning Milk Co., Salt Lake City.

SPECIAL MORNING BRAND VITAMIN D EVAPORATED MILK, containing 400 U. S. P. units of vitamin D and 2000 U. S. P. units of vitamin A, supplied by Clo-Dee in butterfat, per 14½ ounce can.

The Page Milk Company, Merrill, Wis.

PAGE BRAND VITAMIN D EVAPORATED MILK, containing 400 U. S. P. units of vitamin D and 2000 U. S. P. units of vitamin A, supplied by Clo-Dee in vegetable oil, per 14½ ounce can.

Milk Fortified by Irradiation

Milk

Pasteurized milk containing 135 U. S. P. units of vitamin D per quart, bottled and distributed by the following firms, stand accepted:

Abbotts Dairies, Inc., Philadelphia.

Adohr Milk Farms, Los Angeles.

Alderney Dairy Company, Newark, N. J.

Annette's Dairy, Savannah, Ga.

Beatrice Creamery Company, Denver, and Tulsa, Okla.

Bentley & Renckens, Dunkirk, N. Y.

Biltmore Dairy Farms, Biltmore, N. C.

Blossom Dairy Company, Charleston, W. Va.

The Borden Company, New York.

Products distributed by Borden Farm Products Company of Chicago; Borden's Farm Products Company, Inc., New York; Borden's Farm Products Company of Michigan, Detroit; Borden's Vitamin D Milk Company, Sacramento, Calif.; Castanea Dairy Company, Trenton, N. J. (Grades A and B); Collar City Creamery, Troy, N. Y.; Gridley Dairy Company, Inc., Milwaukee; Kennedy-Mansfield Dairy Company, Madison, Wis.; The Marin County Irradiated Vitamin D Milk Company, San Rafael, Calif.; Borden Dairy Delivery Company, Burlingame, Calif.

Borden Dairy Delivery Company, San Francisco. *See* The Borden Company, New York.

Borden's Farm Products Company, Inc., New York. *See* The Borden Company, New York.

Borden's Vitamin D Milk Company, Sacramento, Calif. *See* The Borden Company, New York.

The Bowman Dairy Company, Chicago.

The Buck Dairy, Marquette, Mich.

David Buttrick Company, Arlington, Mass.

Capitol Dairy Company, Chicago.

Carlson-Frink Company, Denver.

Carrigan's Niagara Dairy Company, Niagara Falls, N. Y.

Castanea Dairy Company, Trenton, N. J. *See* The Borden Company, New York.

Clover Creamery Co., Inc., Roanoke, Va.

Clover Leaf Dairy Company, Racine, Wis.

Clover Leaf-Harris Dairy, Salt Lake City.

Collar City Creamery, Troy, N. Y. *See* The Borden Company, New York

Wm. Colteryahn & Sons Company, S. S. Pittsburgh.

Dairy Laboratories, Inc., Seattle.

Dairymen's League Cooperative Association, Syracuse, N. Y.

Detroit Creamery Company, Detroit.

Ebling Creamery Company, Detroit.

Ferndale Farms, Inc., Brooklyn.

Fischl Ice Cream & Dairy Company, Manitowoc, Wis.

The Foland Dairy Company, Bridgeport, Conn.

Fulton Park Dairy, Hillsdale, Ore.

Gardner Creamery, Gardner, Mass.

Genessee Dairy Company, Flint, Mich.

Golden Guernsey Dairy Co-Operative, Milwaukee.

Gridley Dairy Company, Inc., Milwaukee. *See* The Borden Company, New York.

Harris Cream Top Milk Company, Houston, Texas.

W. D. F. Hayden Dairy Company, Dover, N. H.

H. P. Hood & Sons, Inc., Boston.

Hunding Dairy Company, Chicago.

International Dairy Company, Chicago. Product also distributed by Vita Dee Dairies, Inc., Chicago.

Iowana Farms Milk Company, Davenport, Iowa.

Jeppe's Dairy, Grand Rapids, Mich.

Kennedy-Mansfield Dairy Company, Madison, Wis. *See* The Borden Company, New York.

Kitsap Dairy, Bremerton, Wash.

Kleinheinz Dairy Company, Wausau, Wis.

Lakeside Dairy, Inc., Sioux Falls, S. D.

Laurel Hill Creamery, Gardner, Mass.

F. B. Mallory, Inc., Springfield, Mass.

The Marin County Irradiated Vitamin D Milk Company, San Rafael, Calif. *See* The Borden Company, New York.

H. A. McDonald Creamery Company, Detroit.

Medosweet Dairies, Inc., Tacoma, Wash.

Menzie Dairy Company, McKeesport, Pa.

Michigan State College Creamery, E. Lansing, Mich.

Millside Farms, Riverside, N. J.

The Mitchell Dairy Company, Inc., Bridgeport, Conn.

Modern Dairy Company, La Crosse, Wis.

Natoma Farm, Hinsdale, Ill.

Old Tavern Farm, Inc., Portland, Maine.

Onondaga Milk Producers, Syracuse, N. Y. *See* Dairymen's League Cooperative Association, Syracuse, N. Y.

Pevely Dairy Company, St. Louis.

Portland Milk Producers Association, Inc., Portland, Ore.

Port Murray Dairy Company, Port Murray, N. J.

Producers Creamery, Benton Harbor, Mich.

The Producers Milk Company, Cleveland.

Pure White Dairy Company, Tulsa, Okla. (Jersey, Special, Holstein).

Quality Milk Products Company, Tulsa, Okla.

Reid's Union Dairy, Brooklyn.

Richmond Dairy Company, Richmond, Va.

Riverview-Damascus Milk Company, Portland, Ore.

Rochester Dairy Company, Rochester, Minn.

Rosebud Creamery Co., Detroit.

Rosedale Dairy, Norfolk, Va.

Scholl Dairy Company, Michigan City, Ind.

Sheboygan Falls Creamery Co., Sheboygan, Wis. *See* The Vitamin D Milk Company, Sheboygan, Wis.

J. H. Story & Son Dairy, New Haven, Conn.

Stueber Dairy Company, Wausau, Wis.

The Supreme Dairy Company, Denver.

Thompson's Dairy, Washington, D. C.

Torrington Creamery, Inc., Torrington, Conn.

United Dairy Company, Inc., Chicago.

Valley Bell Dairy Company, Inc., Charleston, W. Va.

Verifine Dairy Products Corporation, Sheboygan, Wis. *See* The Vitamin D Milk Company, Sheboygan, Wis.

Vita Dee Dairies, Inc., Chicago. *See* International Dairy Company, Chicago.

The Vitamin D Milk Company, Sheboygan, Wis. Products distributed by Sheboygan Falls Creamery Co., Sheboygan, Wis., and Verifine Dairy Products Corporation, Sheboygan, Wis.

Sidney Wanzer & Sons, Inc., Chicago.

West End Dairy, Charleston, S. C.

Western Creameries, Inc., Tulsa, Okla. (Grade A Holstein, Grade A, Grade A, Jersey.)

Western Dairy Company, Chicago.

Whiting Milk Companies, Boston and Worcester, Mass. (Regular and Old Homestead 5%.)

Wieland Dairy Company, Inc., Chicago.

Willow Brook Dairy, Mount Vernon, N. Y.

Ira Wilson & Sons Dairy Company, Detroit.

R. F. Worden & Sons, Inc., Waterbury, Conn.

Pasteurized milk containing 136 U. S. P. units of vitamin D per quart, bottled by manufacturers of accepted vitamin D fortified milk products, distributed under private label brands of the following firms. The labels and advertising are in accord with Council Rules and Decisions.

Baker's Dairy, La Crosse, Wis.

Peninsula Dairy, Newport News, Va.

Homogenized Milk

Homogenized, pasteurized milk containing 135 U. S. P. units of vitamin D per quart, bottled and distributed by the following firms, stand accepted:

General Ice Cream Corporation (New Haven Dairy Division) New Haven, Conn.

Pevely Dairy Company, St. Louis. (Super Test Special Grade A Irradiated Homogenized Milk and Irradiated Homogenized Milk.)

Producers Milk Company, Cleveland.

Sullivan Milk Products, Battle Creek, Mich.

Evaporated Milk

The following firms manufacture and distribute accepted brands of evaporated milk fortified with vitamin D. Each 14½ ounce can diluted with an equal volume of water furnishes not less than 135 U. S. P. units of vitamin D per quart.

The Borden Company, New York.

Products distributed by The Borden Sales Company, Inc., New York, Chicago and San Francisco.

BORDEN BRAND IRRADIATED EVAPORATED MILK.
BORDEN'S PEARL BRAND IRRADIATED EVAPORATED MILK.
BORDEN'S SILVER COW BRAND IRRADIATED EVAPORATED MILK.
ROSE BRAND IRRADIATED EVAPORATED MILK.

The Borden Sales Company, Inc., New York, Chicago and San Francisco. *See* The Borden Company, New York.

The Carnation Company, Milwaukee.

CARNATION BRAND IRRADIATED EVAPORATED MILK.

Products distributed by Colorado Condensed Milk Co., Fort Lupton, Colo.
COLUMBINE BRAND IRRADIATED EVAPORATED MILK.
RED CROSS BRAND IRRADIATED EVAPORATED MLDK.

Products distributed by Mohawk Milk Products Co., Inc., New York.
BLUE CROSS BRAND IRRADIATED EVAPORATED MILK.
GOLD CROSS BRAND IRRADIATED EVAPORATED MILK.

Product distributed by Northfield Milk Products Company, Northfield, Minn.
NORTHFIELD BRAND IRRADIATED EVAPORATED MILK.

Colorado Condensed Milk Co., Fort Lupton, Colo. *See* The Carnation Company, Milwaukee.

Indiana Condensed Milk Co., Indianapolis.

COOL SPRING BRAND IRRADIATED EVAPORATED MILK.
WILSON BRAND IRRADIATED EVAPORATED MILK.

Mohawk Milk Products Co., Inc., New York. *See* The Carnation Company, Milwaukee.

Nestle's Milk Products, Inc., New York.

ALPINE BRAND IRRADIATED EVAPORATED MILK.
EVERY DAY BRAND IRRADIATED EVAPORATED MILK.
LION BRAND IRRADIATED EVAPORATED MILK.
NESTLE'S BRAND IRRADIATED EVAPORATED MILK.

Product distributed by Nestle's Milk Products (Canada), Ltd., Toronto, Canada.
NESTLE'S BRAND IRRADIATED EVAPORATED MILK.

Northfield Milk Products Company, Northfield, Minn. *See* The Carnation Company, Milwaukee.

Pet Milk Company, St. Louis.

DANISH PRIDE BRAND IRRADIATED EVAPORATED MILK.
GOLDEN KEY BRAND IRRADIATED EVAPORATED MILK.
PET BRAND IRRADIATED EVAPORATED MILK.
SEGO BRAND IRRADIATED EVAPORATED MILK.

Dried Milk

The Borden Company, New York.

DRYCO BRAND IRRADIATED DRIED SKIMMED MILK, drum dried irradiated milk (milk irradiated under license of the Wisconsin Alumni Research Foundation. U. S. Patents 1,680,818 and 18,117,936).

Analysis (submitted by manufacturer).—Moisture 3.0%, ash 7.0%, fat (ether extract) 12.0%, protein (N × 6.38) 32.0%, milk sugar (by difference) 46.0%, iron (Fe) 35 parts per million, copper (Cu) 5.7 parts per million.

Calories—4.2 per gram; 119 per ounce.

Vitamins.—Report of biologic assay (1931) shows that this product contains 1.31 to 1.84 U. S. P. units of vitamin D per gram; 150 to 210 per quart reconstituted to solids content of average milk.

Milk Fortified with Activated Ergosterol

IRRADIATED ERGOSTEROL

Milk

Pasteurized milk containing 400 U. S. P. units of vitamin D per quart, bottled and distributed by the following firms, stand accepted:

Ann Arbor Dairy Co., Ann Arbor, Mich.

Arctic Dairy Products Company, Flint and Lansing, Mich.

The Borden Company, New York. Products distributed by The Borden Company, San Antonio, Texas; The Borden Company, El Paso, Texas. The Gridley Dairy Company, Milwaukee, and Borden Farm Products Division, New York.

Borden Farm Products Division, New York. *See* The Borden Company, New York.

Brookside Dairies, Inc., Waterbury, Conn.

Bryant and Chapman Company, Hartford, Conn. (Grades A and B.)

Grand Rapids Creamery Co., Grand Rapids, Mich.

The Gridley Dairy Company, Milwaukee. *See* The Borden Company, New York.

Madison Consumer's Cooperative, Inc., Madison, Wis.

Ohio Clover Leaf Dairy, Toledo, Ohio.

Peoria Producers Dairy, Peoria, Ill.

Port Murray Dairy Co., Port Murray, N. J. (Grade B.)

Swiss Farm Dairy, Donelson, Tenn.

Tinsley's Sunrise Creamery, Huntington, W. Va.

Homogenized Milk

Homogenized, pasteurized milk containing 400 U. S. P. units of vitamin D per quart, bottled and distributed by the following firms, stand accepted:

Bancroft Dairy Co., Madison, Wis.

The Borden Company, New York. Products distributed by The Borden Company, Corpus Christi, Texas; The Borden Company, San Antonio, Texas, and The Borden Company, Texas Dairy Products Division, Houston, Texas.

Bowman's Farm Dairy, Madison, Wis.

Brown's Creamery Company, Detroit.

Country Club Dairy Co., Kansas City, Mo.

Gehl's Guernsey Farms, Inc., Milwaukee.

Kennedy-Mansfield Dairy, Madison, Wis.

W. H. Lee Dairy (also known as Westwood Dairy), Worcester, Mass.

Luick Dairy Co., Milwaukee, Wis.

Muller's Union Dairy, Rockford, Ill.

New Haven Dairy Division, General Ice Cream Corporation, New Haven, Conn.

Producers Dairy Company, Springfield, Ill.

Union Dairy, Freeport, Ill

Wayne Creamery, Detroit.

Westwood Dairy, Worcester, Mass. *See* W. H. Lee Dairy, Worcester, Mass.

VIOSTEROL A.R.P.I. PROCESS

Milk

Pasteurized milk containing 400 U. S. P. units of vitamin D per quart, bottled and distributed by the following firms, stand accepted:

Adams Dairy, Key West, Fla.

Beatrice Creamery Co., St. Louis.

J. H. Berling Dairy Products Co., Cincinnati. (Grade A.)

Breuninger's Dairies, Philadelphia. (Grade B.)

Brookvale Dairy, Ironwood, Mich.

Cloverleaf Dairy, Leavenworth, Kan.

Cold Spring Creamery, Inc., Roanoke, Va.

Cool Farm Dairy, Kalamazoo, Mich. (Grade A.)

Dairyland Creamery Company, Sioux Falls, S. D.

Dairymens Association Limited, Honolulu.

Dolly Madison Dairies, Eau Claire, Wis.

Edwardsville Creamery Company, Edwardsville, Ill.

Elyria Dairies, Inc., Elyria, Ohio.

Ezinga Milk Company, Grand Rapids, Mich.

Farmers Co-operative Dairy, Winston Salem, N. C. (Grade A.)

Forsgate Farms, Jamesburg, N. J.

Goodrich Dairy, Omaha.

Hanneken Dairy Company, Covington, Ky.

Highland Park Dairy, Muskegon, Mich.

Hileman's Quality Dairy, Altoona, Pa.

Hol-Guerns Milk Farm, Canton, Ohio.

Hygeia Milk Products Company, Harlingen, Texas.

Products distributed at Harlingen, San Benito, Brownsville, Port Isabel, Mercedes, La Feria, Weslaco, Santa Rosa, and Combes, Texas.

Indiana Dairy Company, Indiana, Pa.

Jasper Brothers Dairy, St. Joseph, Mich.

Jersey Gold Creameries, Inc., Shreveport, La.

Kenstone Farm Creamery, Au Sable Forks, N. Y.

Knowlton Creamery, San Antonio, Texas.

Kroger Grocery & Baking Company Dairy, Cincinnati.

Kroger Grocery & Baking Company, Dairy Dept., Grand Rapids, Mich., and Indianapolis.

Lost River Dairy, Klamath Falls, Ore.

Martinecock Jersey Dairy, Locust Valley, Long Island, N. Y.

Metzger Dairies, Houston, Texas.

Miami County Dairy Co., Covington, Ohio.

Midwest Dairy Products Co., Inc., Rochester, Minn. Product distributed by branch at Cape Girardeau, Mo.

Model Dairy, Columbus, Ohio (Grade A.)

The Moore Dairy, Lancaster, Pa.

Nelson's Dairies, Norristown, Pa. (Grade B.)

George T. Niehoff Dairy, Cincinnati.

North Canton Dairies, Inc., North Canton, Ohio.

Okino Farm Dairy, Strafford, Mo.

Pallet Milk Company, Columbus, Ohio.

Peters Dairy, Michigan City, Ind.

Pinehill Farms Dairy, Sharonville, Ohio.

Producers Milk Co., Greenville, Texas.

Purity Milk Company, Phillipsburg, Pa.

Russell Creamery Co., Bemidji, Minn.

Russell Creamery Company, Brainerd, Minn.

J. T. Ruther and Sons Co., Cincinnati.

Sabine Dairies, Port Arthur, Texas.

Saco Dairy, Inc., Saco, Maine. (Grade A.)

Salem Creamery Co., Inc., Salem, Va. (Grade A.)

South St. Louis Dairy Co., St. Louis.

The Sunny Valley Corp., New Milford, Conn.

Tech Food Products Co., Youngstown, Ohio.

Thompson Dairy Company, Billings, Mont. (Grade A)

Trapp's Golden Rule Dairy, Inc., Milwaukee.

John Trenkamp's Dairy, Covington, Ky.

United Dairies Incorporated, Burlington, Iowa.

Van Cortlandt Dairy, Peekskill, N. Y.

Walnut Bank Farms, Quakertown, Pa.

J. Weber Company, Cincinnati.

Weiser's Dairy, West Des Moines, Iowa.

Weller's Dairy, Johnstown, Pa.

White Plains Dairy, White Plains, N. Y.

H. Woebkenberg Dairy Co., Reading, Ohio.

Woodson Dairy Co., Red Hill, Pa. (Grade B.), product also distributed at Allentown, Quakertown, Pennsburg and East Greenville, Pa.

Young's Dairy, Inc., Columbus, Ohio.

Homogenized Milk

Homogenized, pasteurized milk containing 400 U. S. P. units of vitamin D, per quart, bottled and distributed by the following firms, stand accepted:

Alamito Dairy, Omaha.

Belle Isle Farm, Akron, Ohio.

Boutwell's Dairy, Lake Worth, Fla.

Esmond Dairy Company, Sandusky, Ohio.

A. G. Freeman Dairy, Allentown, Pa. (Grade B.)

Lockshort Farms, Inc., Kalamazoo, Mich.

Lange Milk Co., St. Louis.

Maney Dairy, Inc., Granite City, Ill.

Niederer Dairy, East St. Louis, Ill.

Northampton Sanitary Dairy, Northampton, Pa.

Palmerton Sanitary Dairy, Palmerton, Lehighton, Slatington, Mauch Chunk and Nesquehoning, Pa.

Reiter Dairy Company, Akron, Ohio. (Mel-O-Milk Brand)

Rothermel's Dairy, Minersville, Pa.

St. Paul Milk Co., St. Paul.

Williams-McWilliams Dairy Products, Inc., Ft. Lauderdale, Fla.

Vitamin D Milk Produced by Feeding Cows Irradiated Yeast

Milk

Pasteurized milk containing 400 U. S. P. units of vitamin D per quart, bottled and distributed by the following firms, stand accepted:

W. T. Boyd & Sons, Inc., Nashua, N. H.

Frates Dairy Company, New Bedford, Mass.

Hillcrest Dairy Inc., Worcester, Mass.

Kalamazoo Creamery Company, Kalamazoo, Mich.

Moler's Belmont Dairy Co., Dayton, Ohio.

Mountrose Dairy Company, Akron, Ohio.

Waldell Farm Dairy, Alliance, Ohio.

Waveney Farm, Framingham, Mass.

Ira Wilson & Sons Dairy Co., Detroit.

CHEESE

Cream Cheese

The listed products of the following firms stand accepted:

Breakstone Brothers, Inc., New York.

BREAKSTONE'S CREAM CREST BRAND CREAM CHEESE, prepared from pasteurized cultured sweet cream seasoned with salt.

Analysis (submitted by manufacturer).—Moisture 54.6%, ash 1.0%, fat (ether extract) 37.4%, protein (N × 6.38) 6.0%, lactose (by difference) 1.0%.

Calories.—3.6 per gram; 102 per ounce.

DAISY BRAND CREAM CHEESE, prepared from pasteurized cultured sweet cream seasoned with salt.

Analysis and Calories.—See Breakstone's Cream Crest Brand Cream Cheese.

The Fairmont Creamery Company, New York.

FAIRMONT BRAND CREAM CHEESE, prepared from cream mildly seasoned with salt.

Analysis (submitted by manufacturer).—Moisture* 45 to 50%, ash 1.0%, salt 0.5%, fat (Mojonnier method)* 40 to 45%, protein (N × 638) 4.5 to 5.5%, carbohydrates (by difference) 3.0%, titratable acidity as lactic acid 0.3 to 0.4%, calcium (Ca) 0.04%.

Calories.—4.2 per gram; 119 per ounce.

* Mojonnier and Troy, "The Technical Control of Dairy Products," pp. 110-127.

Compounded Cheese

The listed products of the following firms stand accepted:

The Borden Company, New York.

BORDEN'S CHATEAU, a mixture of Cheddar cheese, cream, skimmed milk powder, water, disodium phosphate, sodium chloride, sodium citrate, citric acid and annatto.

Analysis (submitted by manufacturer).—Moisture 42.0%, total solids 58.0%, ash 5.4%, sodium chloride (NaCl) 3.0%, fat (ether extract) 27.3%, protein (N × 6.38) 19.3%, lactose 5.0%, crude fiber none, carbohydrates (by difference) 6.0%, calcium (Ca) 0.60%.

Calories.—3.47 per gram; 99 per ounce.

BORDEN'S CHATEAU PIMIENTO, a mixture of Cheddar cheese, cream, skimmed milk powder, pimiento, water, disodium phosphate, sodium chloride, sodium citrate, citric acid and annatto.

Analysis (submitted by manufacturer).—Moisture 39.5%, total solids 60.5%, total ash 5.0%, sodium chloride (NaCl) 1.9%, fat (ether extract) 31.1%, protein (N × 6.38) 21.7%, lactose (by difference) 2.7%.

Calories.—3.78 per gram; 107 per ounce.

Kraft-Phenix Cheese Corporation, Chicago.

VELVEETA, a mixture of Cheddar cheese, cream (or butter and skimmed milk powder), milk whey powder and salt.

Analysis (submitted by manufacturer).—Moisture 44.0%, total solids 56.0%, ash 6.0%, fat 25.5%, protein (N × 6.38) 18.0%, lactose * 6.3%, calcium (Ca) 0.53%, phosphorus (P) 0.71%.

Calories.—3.27 per gram; 93 per ounce.

Vitamins.—It was reported in 1930 that the vitamin A content of Velveeta was approximately 10 Sherman (7.5 international) units per gram. In 1936 it was found by biologic assay also that the product contains 1 Sherman-Bourquin unit of vitamin G (riboflavin) per gram.

PABST-ETT BRAND COMPOUNDED CHEESE, a mixture of American Cheddar cheese, milk whey, whole milk, water, disodium and trisodium phosphates as emulsifiers and salt.

Analysis (submitted by manufacturer).—Moisture 44.0%, total solids 56.0%, ash 5.2%, sodium chloride (NaCl) 1.7%, fat (ether extract) 24.3%, protein (N × 6.38) 19.9%, lactose (by difference) 6.6%, phosphorus (P) 0.33%.

Calories.—3.25 per gram; 92 per ounce.

Vitamins.—The manufacturer reports that biologic assay has shown the product contains about 10 Sherman (7.5 international) units (1931) of vitamin A and 1 Sherman-Bourquin unit (1936) of vitamin G (riboflavin) per gram. In 1931 the product was reported to contain 1 6 Sherman-Spohn units of vitamin B complex per gram.

PABST-ETT BRAND COMPOUNDED PIMIENTO CHEESE, a mixture of American cheese, pimiento, milk whey, disodium and trisodium phosphate as emulsifiers and salt.

Analysis (submitted by manufacturer).—Moisture 44.9%, total solids 55.1%, ash 6.0%, sodium chloride (NaCl) 1.8%, fat (ether extract) 24.0%, protein (N × 6.38) 18.7%, lactose (by difference) 6.4%, phosphorus (P) 0.32%.

Calories.—3.17 per gram; 90 per ounce.

PABST-ETT BRAND COMPOUNDED SWISS CHEESE, a mixture of Swiss and American cheese, water, evaporated milk, milk whey, disodium phosphate as emulsifier and salt.

Analysis (submitted by manufacturer).—Moisture 44.8%, total solids 55.2%, ash 5.2%, sodium chloride (NaCl) 1.4%, fat (ether extract) 21.8%, protein (N × 6.38) 23.6%, lactose (by difference) 4.6%, phosphorus (P) 0.37%.

Calories.—3.09 per gram; 88 per ounce.

---

* Bertrand method, Mathews Physiological Chemistry, p. 952.

Process Cheese

The listed products of the following firms stand accepted:

Kraft-Phenix Cheese Corporation, Chicago.

PABST BRAND PASTEURIZED PROCESS CHEESE, made from American cheese, containing disodium and trisodium phosphates as emulsifiers and salt.

Analysis (submitted by manufacturer).—Moisture 39.8%, ash 5.0%, salt in ash 1.4%, fat (ether extract) 30.8%, protein (N $\times$ 6.38) 22 9%, lactose (by difference) 1.5%, phosphorus (P) 0.35%.

Calories.—3.75 per gram; 106 5 per ounce.

PABST BRAND PASTEURIZED PROCESS CHEESE, made from American cheese, containing disodium and trisodium phosphates as emulsifiers, with pimientos and salt.

Analysis (submitted by manufacturer).—Moisture 39.9%, ash 5.0%, salt in ash 1.6%, fat (ether extract) 30.4%, protein (N $\times$ 6.38) 22.6%, lactose (by difference) 2.1%, phosphorus (P) 0.35%.

Calories.—3.72 per gram; 105.6 per ounce.

PABST BRAND PASTEURIZED PROCESS CHEESE, a blend of process brick and process American cheese, containing disodium and trisodium phosphates as emulsifiers and salt.

Analysis (submitted by manufacturer).—Moisture 41.1%, ash 5.5%, salt in ash 1.8%, fat (ether extract) 29.8%, protein (N $\times$ 6.38) 22.5%, lactose (by difference) 1.1%, phosphorus (P) 0.35%.

Calories.—3.63 per gram; 103 per ounce.

PABST BRAND PASTEURIZED PROCESS CHEESE, a blend of process Swiss and process American cheese, containing disodium and trisodium phosphates as emulsifiers and salt.

Analysis (submitted by manufacturer).—Moisture 39.7%, ash 4.8%, salt in ash 1.6%, fat (ether extract) 27.4%, protein (N $\times$ 6.38) 25.5%, lactose (by difference) 2.6%, phosphorus (P) 0.28%.

Calories.—3 6 per gram; 102 per ounce.

SECTION IX

Foods for Special Dietetic Purposes

Certain preparations not commonly classed among the usual table foods are of value for increasing the vitamin or mineral content, or both, of therapeutic and other diets. These products come within the category designated by the Council on Foods as "Special Purpose Foods." Examples of such products are wheat germ, yeast, the dried and powdered leaves of young cereal grasses, and certain mixtures containing substances rich in vitamins or minerals or both.

Other foods described in this section are products processed or specifically designed for adaptability to special dietetic purposes. Their composition must be known with some degree of accuracy and declared on the label, and the special feature for which the product is useful must be declared.

Labels and Advertising of Foods for Special Dietary Use.—The labels and advertising shall contain a statement listing all dietary ingredients of nutritional significance in the order of decreasing predominance by weight, and shall indicate the special purpose for which the product is intended. These statements, so far as is practical, should be in close proximity to the trade name. In addition, as much of the following information should be given as is significant to permit the intelligent use of the particular product by the consumer: Specific properties, vitamin and mineral content, the calories per gram or ounce, and the grams each of carbohydrate, protein and fat per portion.

In the case of water packed fruits and vegetables, a statement to the effect that this food or these foods are prepared with special reference to the needs of invalids and have no added salt or sugar, should be included on the label. There should be stated on the label the calories per gram or ounce and the grams each of total carbohydrate, available carbohydrate, protein, and fat per 100 Gm. weight of fruit or vegetable and liquid.

The Food and Drug Administration of the United States Department of Agriculture now is concerned with the drafting of regulations pertaining to foods for special dietary purposes under the authority granted to the Secretary of Agriculture by Section 403 (j) of the Food, Drug and Cosmetic Act.

When claims are made for content of vitamins, as in the case of foods designed to supplement the vitamin content of therapeutic and other diets or to replace other food in reducing diets, satisfactory evidence must be presented that storage under ordinary conditions does not lower the vitamin potency of a product below the assay value claimed. For products which ordinarily are stored at room temperature, suitable evidence on this point, is obtained by assay of material which has been

maintained for three months at a temperature of 100 F. For products which ordinarily are kept in the refrigerator, suitable evidence is obtained by assay of specimens which have been maintained for suitable periods at refrigerator temperature.

WHEAT GERM

The yellow germ, or embryo, of wheat is that portion of the grain from which develop the new stem and roots of the sprouting seed. It amounts to only about 2 per cent of the grain but is of nutritional importance because it contains a much higher concentration of vitamin B_1 than the endosperm.

Wheat germ is obtained from the mills as a by-product of white flour. When the grain is crushed, the germ is loosened, and because of its size it gets into the coarse middlings. When these so-called germ middlings are acted on by the smooth rollers, the germ is flattened because it is tougher than the endosperm, and in this condition it may be sifted from the flour. This crude wheat germ, which contains some endosperm and considerable bran, formerly was used only in animal feeding because of its poor keeping quality. In recent years, however, the germ is separated more completely from other materials and is so treated that spoilage is retarded or prevented. The so-called purified wheat germ is now available in a pleasing, palatable form for human consumption.

The poor keeping quality of crude wheat germ is usually attributed to the development of rancidity of the oils, which usually amount to about 10 per cent of the product. When the grain is crushed, the germ is bruised, and certain enzymes in the germ become activated. Heating probably inactivates these enzymes. The toasting of wheat germ at 120 to 130 C. leads to the production of a light brown product with enhanced keeping qualities.[1] Other methods of heat treatment have been developed. Although the keeping quality of the commercially available heat-treated wheat germ products is good, it is advisable to store the material in a refrigerator. One accepted product with enhanced keeping qualities is prepared by extracting most of the fat from the wheat germ with an organic solvent. The solvent and dissolved oil are removed, and the defatted germ is heated to volatilize all traces of the fat solvent. The resulting product is packed in cans.

Composition.—Analyses of wheat germ show variation which is due in part to the variety of wheat.[2] In general, the protein content ranges from 25 to 35 per cent, the fat content from 11 to 14 per cent and the carbohydrate content from 36 to 48 per cent. The mineral content varies considerably also. The aver-

1. Hertwig, R.: Mildly Toasted Wheat Germ: A Possible Merchandizable Table Cereal, Cereal Chem. **8**: 226 (May) 1931.
2. Sullivan, B., and Bailey, C. H.: The Lipids of the Wheat Embryo: I. The Fatty Acids, J. Am. Chem. Soc. **58**: 383 (March) 1936; II. The Unsaponifiable Fraction, ibid. **58**: 390 (March) 1936.

age percentage composition is given as follows: Moisture 9, protein (N $\times$ 6.25) 27, fat (ether extract) 11, carbohydrate 48 and ash 5.

The minerals found in wheat germ are chiefly phosphorus, magnesium and calcium, together with small amounts of iron. A representative mineral analysis gives the following percentages: phosphorus 1, calcium 0.05, magnesium 0.3 and iron 0.007.

Nutritive Value.—Wheat germ products are particularly useful because of their thiamin (vitamin B_1) content. There is increased clinical evidence that the amount of thiamin in many diets is apt to be below the optimum for good health.[3] Although thiamin is present in nearly all plant and animal foods, the amounts are small, less than one part per million. Wheat germ, however, is so rich in thiamin that its administration for this purpose places it almost in the class of a pharmaceutical product. Commercial preparations of wheat germ may be expected to contain from 8 to 15 international units, or from 26 to 50 micrograms,[4] per gram.

Leong and Harris [5] determined the thiamin content of wheat germ and other cereal preparations and found by the bradycardia method a vitamin B_1 content ranging from 6.6 to 9.6 international units per gram; a preparation of wheat germ and white flour ("germ flour") had 1.2, whole meal flour 1.5, middlings 4.5, bran 3.6 and white flour 0.3 international units of vitamin B_1 per gram. Leong and Harris [5] suggested that 10 international units of vitamin B_1 per gram represents the thiamin potency of wheat germ, although many of their values are lower.

The thiamin potency of wheat germ appears to vary somewhat with the variety of wheat and the conditions under which it has been grown. Baker and Wright [6] reported that a sample of a proprietary brand of purified wheat germ had 15 international units of vitamin B_1 per gram, while different specimens of "crude wheat germ" assayed at 5.9, 8.5, 10.5, 12.0 and 19.8 international units per gram (bradycardia method). Morgan and Hunt [7] reported that the vitamin B_1 content of wheat germ is from 7.6 to 9.4 international units per gram. In general, commercial preparations of wheat germ may be expected to contain from about 8 to about 15 international units of vitamin B_1 per gram.

Wheat germ is not only a rich source of thiamin but it contains other components of the vitamin B complex (riboflavin,

---

3. Williams, R. R., and Spies, T. D.: Vitamin B_1 and Its Use in Medicine, New York, The Macmillan Company, 1938, p. 235.

4. The international standard for vitamin B_1 is crystalline thiamin chloride: 1 international unit of vitamin B_1 is equal to 3 micrograms of thiamin chloride, or 1 microgram is equal to 0.33 international unit.

5. Leong, P. C., and Harris, L. J.: Vitamin B_1 and the "Brown Versus White Bread Problem," Biochem. J. **31**: 812 (May) 1937.

6. Baker, A. Z., and Wright, M. D.: The Vitamin B_1 content of Foods, Biochem. J. **29**: 1802 (July) 1935.

7. Morgan, A. F., and Hunt, M. J.: The Vitamin B (B_1) and G (B_2) Content of Wheat Products, Cereal Chem. **12**: 411 (July) 1935.

nicotinic acid or its amide and vitamin B_6). Members of the vitamin B complex tend to occur together in nature just as vitamin A and vitamin D do in fish liver oils.

The vitamin G (riboflavin) content of wheat germ, according to Daniel and Munsell's [8] figures, varies from 150 to 400 Sherman-Bourquin units per hundred grams.

Sebrell [9] reported that 150 Gm. of wheat germ contains enough of the pellagra-preventive factor, probably nicotinic acid or its amide, to prevent pellagra. He gave wheat germ the rating "good," a term which he used to designate the foods most valuable in the prevention and treatment of pellagra. However, the amount of wheat germ suggested for daily consumption (½ to 1 ounce, or 15 to 34 Gm.) in order to supply thiamin (vitamin B_1) can hardly supply a quantity of nicotinic acid significant enough to warrant emphasis.

Wheat germ also contains some vitamin B_6, one of the water soluble compounds of the vitamin B complex which may be important in human nutrition.[10]

Wheat germ preparations, unless the fat has been removed, contain some vitamin E. Since there are at present no adequate scientific data definitely establishing the role of vitamin E in human dietetics, the Council does not approve claims addressed to the public or to the medical profession on labels or in advertising of accepted foods if directly or indirectly they recommend the foods because of their vitamin E content. Vitamin E is present in many common foods. Green foods, such as lettuce and watercress and milk and milk products, are rich sources of the vitamin. The necessary amount, as far as is known, may be acquired from any good diet. Statements or claims referring to vitamin E in advertising imply a need for special sources of this vitamin that is not indicated by present knowledge.

Allowable Claims for Wheat Germ.—The Council on Foods recognizes that in the amount of wheat germ ordinarily consumed (manufacturers suggest one-half to one ounce a day) there is sufficient vitamin B_1, vitamin G and phosphorus to warrant recognizing the following claims:

1. Wheat germ is a rich source of vitamin B_1
2. Wheat germ is a rich source of phosphorus
3. Wheat germ contains some vitamin G (riboflavin).

Wheat germ in general will not be recognized as a good source of vitamin G unless the firm furnishes evidence that its particular product does furnish a suitable proportion of the "daily allowance" for this factor. Although wheat germ contains some vitamin B_6 no claim for this factor is recognized at the

8. Daniel, E. P., and Munsell, H. E.: Vitamin Content of Foods, Miscellaneous Publication 275, United States Department of Agriculture, June 1937.

9. Sebrell, W. H.: Vitamins in Relation to the Prevention and Treatment of Pellagra, J. A. M. A. **110**: 1665 (May 14) 1938.

10. Harris, S. A., and Folkers, K.: Synthesis of Vitman B_6. J. Am. Chem. Soc. **61**: 1245 (May) 1939. Spies, T. D., Bean, W. B., and Ashe, W. F.: A Note on the Use of Vitamin B_6 in Human Nutrition, J. A. M. A. **112**: 2415 (June 10) 1939.

present time because the exact role of this substance in human nutrition and the daily requirements are not established. Wheat germ, when given in large quantities—200 grams—contains sufficient nicotinic acid to cure pellagra, but in the amounts ordinarily consumed there is some doubt about there being sufficient nicotinic acid to be useful. For this reason the claim that a wheat germ preparation is a rich source of the P-P factor cannot be recognized until more substantial evidence of an acceptable nature is made available to the Council. There is no objection to the statement of composition of wheat germ on labels or in advertising or the statement that the product contains a definite amount of oil natural to the germ, but the phrase "Wheat germ contains — per cent of natural wheat germ oil" is objectionable because "wheat germ oil" practically means "vitamin E." No claim for vitamin E is recognized and wheat germ oil is not acceptable to the Council on Pharmacy and Chemistry.

Accepted products of refined wheat germ, because of their low crude fiber content, may be given to children and to persons who have sensitive digestive tracts. In addition to contributing unique food values, wheat germ preparations are an appetizing addition to salads, vegetable dishes, biscuits, breads, cakes, meats, desserts and other dishes of the American table.

The listed wheat germ products of the following firms stand accepted:

American Vitamins, Inc., New York. *See* Bemax Laboratories, New York.

Catherine S. Anderson, Grosse Pointe, Mich.

ANDERSON'S BRAND WHEAT GERM, flaked wheat germ not heat treated, containing 85 per cent germ, 10 per cent bran and 5 per cent endosperm. Immediate packing, refrigeration and a quick turnover insure that a fresh product reaches the consumer.

Analysis (submitted by manufacturer).—Moisture 6.0%, total solids 94.0%, ash 4.5%, fat (ether extract) 12.3%, protein (N × 5.8) 31.1%, sucrose 16.3%, reducing sugar as dextrose 1.2%, crude fiber 2.5%, carbohydrates other than crude fiber (by difference) 43.6%, iron (Fe) 10 mg. per hundred grams.

Calories.—4.1 per gram; 116 per ounce.

Vitamins.—Biologic assays (1938) reported by the manufacturer showed 7.9 international units of vitamin B_1 and 4 Sherman-Bourquin units of vitamin G per gram; 224 and 114 units, respectively, per ounce.

Bemax Laboratories, Inc., New York, the United States distributor for American Vitamins, Inc., a branch of Vitamins Limited, London, England.

BEMAX, wheat germ practically free from bran subjected to moderate heat treatment.

Analysis (submitted by manufacturer).—Moisture 6.0%, total solids 94.0%, ash 4.5%, fat 9.0%, protein (N × 5.8) 34.4%, crude fiber 1.5%, starch (acid hydrolysis method) 36.0%, carbohydrates other than crude fiber (by difference) 44.6%, calcium (Ca) 86 mg. per hundred grams, magnesium (Mg) 0.39%, iron (Fe) 9.6 mg. per 100 grams, phosphorus (P) 0.76%.

Calories.—3.97 per gram; 114 per ounce.

Vitamins.—Biologic assay (1938) reported by the manufacturer showed 12 to 15 international units of vitamin B_1 per gram; 341 to 426 per ounce. Biologic assay (1937) reported by the manufacturer showed 2.9 Sherman-Bourquin units of vitamin G (riboflavin) per gram; 82 per ounce.

General Mills, Inc., Minneapolis.

EMBO, wheat germ practically free from bran and endosperm, mildly treated with heat.

Analysis (submitted by manufacturer).—Moisture 3.0 to 5.0%, total solids 97.0 to 95.0%, ash 4.0 to 5.0%, fat 10 0 to 13.5%, protein (N × 5.8) 26.0 to 31.6%, crude fiber 1.6 to 2.2%, carbohydrates other than crude fiber (by difference) 55.4 to 47.7%, phosphorus (P) 1.08%, potassium (K) 0.99%, magnesium (Mg) 0.30%, calcium (Ca) 40 mg. per hundred grams, silicon (Si) 10 mg. per hundred grams, iron (Fe) 7 mg. per hundred grams.

Calories.—4.16 to 4.23 per gram; 118 to 120 per ounce.

Vitamins.—Biologic assays (1936) reported by the manufacturer showed 8.77 international units of vitamin B_1 and 4 Sherman-Bourquin units of vitamin G per gram; 249 and 114 units, respectively, per ounce.

National Oil Products Company, Harrison, N. J., product distributed by **Vitab Corporation, San Francisco.**

VITAB, ground and bolted wheat germ and rice polishings, mildly treated with heat.

Analysis (submitted by manufacturer).—Moisture 9.9%, total solids 90.1%, ash 7.5%, fat 13.2%, protein (N × 6.25) 12.1%, reducing sugars as maltose 4.5%, starch (acid hydrolysis method) 38.3%, crude fiber 0 7%, carbohydrates other than crude fiber (by difference) 56.6%, calcium (Ca) 0.26%, chlorine (Cl) 10 mg. per hundred grams, iron (Fe) 13 mg. per hundred grams, magnesium (Mg) 0.77%, phosphorus (P) 1.69%, potassium (K) 1.39%, sodium (Na) 60 mg. per hundred grams, sulfur (S) 0.21%.

Calories.—3.9 per gram; 97 per ounce.

Vitamins.—Biologic assay (1932) reported by the manufacturer showed 7.3 Sherman-Chase (3.6 international) units of vitamin B_1 per gram; 207 Sherman-Chase (102 international) units per ounce.

E. R. Squibb & Sons, New York.

SQUIBB BRAND MALTED WHEAT GERM EXTRACT, an extract of malted wheat germ and U. S. P. malt, essentially maltose, dextrins and "starch intermediate products," cooked, dried and ground; U .S. patents 1,541,263 (June 9, 1925); 1,640,182 (Aug. 23, 1927); 1,640,193 (Aug. 23, 1927).

Analysis (submitted by manufacturer).—Moisture 3%, total solids 97%, ash 5%, fat none, soluble protein (albuminoid N × 6.25) 8%, soluble amino and other nitrogenous compounds (amino N × 6.25) 12%, reducing sugars as maltose 31%, maltodextrins (total carbohydrates minus reducing sugars and dextrins) 25%, dextrins (methyl alcohol precipitation method [11]) 36%, crude fiber none, total carbohydrates (by difference) 72%, iron (Fe) 12 mg. per hundred grams, copper (Cu) 3 mg. per hundred grams, manganese (Mn) 1.5 mg. per hundred grams.

Calories.—3.7 per gram; 105 per ounce.

Vitamins.—Biologic assay (1935) reported by the manufacturer showed 8 international units of vitamin B_1 per gram, 227 units per ounce. Biologic assay (1938) against crystalline riboflavin as standard showed 10 micrograms of riboflavin per gram; 284 micrograms per ounce.

VioBin Corporation, Chicago.

VIOBIN, partially defatted and dehydrated wheat germ, treated to volatilize the traces of organic fat solvents.

Analysis (submitted by manufacturer).—Moisture 7.0%, total solids 93.0%, ash 4.9%, fat 2.1%, protein (N × 5.8) 35.3%, crude fiber 2.9%, carbohydrates other than crude fiber (by difference) 47.8%, potassium (K) 1.08%, calcium (Ca) 67 mg. per hundred grams, magnesium (Mg) 0.35%, phosphorus (P) 1.1%, manganese (Mn) 9 mg. per hundred grams, iron (Fe) 11 mg. per hundred grams.

Calories.—3.6 per gram; 102 per ounce.

---

11. Leach, A. E.: Food Inspection and Analysis, ed. 4, New York, John Wiley & Sons, Inc., 1920, p. 654.

Vitamins.—Biologic assay (1936) reported by the manufacturer showed 14 to 18 Sherman-Chase (7 to 9 international) units of vitamin B_1 per gram; 398 to 511 Sherman-Chase (199 to 255 international) units per ounce.

Vitab Products Co., San Francisco. *See* National Oil Products Co., Harrison, N. J.

Vitamins Limited, London. *See* Bemax Laboratories, Inc., New York.

YEAST

Yeast is a minute unicellular organism; in common with other living cells it contains substances essential for growth and normal nutrition. Yeast cells have long been characterized by their power to convert certain sugars into products of fermentation, a reaction in which enzymes produced by the yeast cell are concerned.

Several forms of fresh, dried and autolyzed yeast now are available commercially. The yeast used in the preparation of these products is cultured on mediums under conditions that preclude outside contamination. The methods of yeast culture generally used are adaptations of the method described by Hansen in 1870.[12] Hansen was the first to show that it is possible to cultivate a pure strain of yeast without the interference of wild yeasts by inoculating a sterilized wort with cultures from a single yeast cell.

The nutritional requirements of yeast itself have been studied by numerous investigators. In 1901 Wildiers[13] reported that yeast is unable to grow appreciably in synthetic mediums unless an essential growth substance, which he called bios, is present. Since that time much research has centered on the question of bios. Although it has not been demonstrated conclusively whether or not yeast can grow at some extremely slow rate on a synthetic medium containing nothing of the nature of bios, there is substantial evidence that growth is greatly accelerated on a synthetic medium containing certain substances called nutrilites.[14] Nutrilites that have been found to be effective are inositol,[15] vitamin B_1,[16] pantothenic acid[17] and biotin,[18] as well as other substances which include some of the thermostable B vitamins known, as a result of animal experiment, to be present in yeast. For a time bios was thought to be identical

12. Hansen, cited by Frey, C. N.: History and Development of Modern Yeast Industry, J. Indust. & Engin. Chem. **22**: 1154 (Nov.) 1930.
13. Wildiers, E.: Une nouvelle substance indispensable au développement de la levure, Cellule **18**: 311, 1901.
14. Miller, W. L.: Wildier's Bios, Science **58**: 187, 1924.
15. Eastcott, E. V.: Wildier's Bios: The Isolation and Identification of "Bios I," J. Phys. Chem. **32**: 1094, 1928.
16. Williams, R. J., and Roehm, R. R.: Effect of Antineuritic Vitamin Preparations on the Growth of Yeast, J. Biol. Chem. **87**: 581 (July) 1930.
17. Williams, R. J., and Saunders, D. H.: Effects of Inositol, Crystalline Vitamin B_1 and "Pantothenic Acid" on the Growth of Different Strains of Yeast, Biochem. J. **28**: 1887, 1934.
18. Kögel, F., and Fries, N.: Ueber den Einfluss von Biotin, Aneurin und Meso-Inosit auf das Wachstum verscheidener Pilzarten, Ztschr. f. Physiol. Chem. **249**: 93 (Sept.) 1937.

with vitamin B. But as early as 1920 Lecoq [19] asserted that the bios of Wildiers is not identical with vitamin B, and subsequent investigation by numerous workers substantiated that view. There is evidence that the addition of thiamin to yeast cultures increases the rate of alcoholic fermentation,[20] and in the current opinion thiamin (or its intermediates) is required by yeast for its normal performance. Indeed, all organisms appear to use thiamin, some lower forms synthesizing the substance and other types, particularly higher organisms, deriving it from the activities of other forms of life.[18] If supplied with traces of thiamin, yeast appears capable of synthesizing more thiamin. In general, the thiamin content of yeast depends on the amount of preformed thiamin in the culture mediums.

At one time brewers' yeast was considered richer in vitamin B_1 than bakers' yeast. Generally speaking, yeast cultured on a molasses wort, poor in vitamin B_1, will contain less vitamin B_1 than yeast cultured on grain wort. There has been a marked tendency in recent years to build up the vitamin B_1 content of bakers' yeast, possibly by culturing the yeast in mediums containing substances rich in thiamin. When selecting a source of vitamin B_1 it would be well to use as a guide the potency of the individual product as determined by assay and declared on the label.

Compressed yeast usually is made from top yeast, which is separated from the wort by skimming, agitated in water, freed from impurities by washing through sieves or by settling, pressed in bags in hydraulic presses, cut into cakes, wrapped in tin foil and kept cold until distributed for use. Sometimes compressed yeast contains a small amount of starch or cereal product.

Dried yeast is prepared either by dehydrating compressed yeast by means of a spray dehydrator [21] or by mixing top yeast with flour or corn meal and dehydrating by the use of tray driers with a current of warm air.

When fresh yeast is allowed to stand for some days in a refrigerator, autolysis sets in and the yeast becomes darker and more fluid. The product is then known as autolyzed yeast. It contains no viable cells and hence initiates no fermentative action in the alimentary tract. It is considered by some workers that the breakdown of the cells also renders the vitamins more readily available.

Composition.—The composition of dried brewers' yeast was reported [22] to be about as follows: moisture 8 per cent, protein 56 per cent, fat 3 per cent, nitrogen-free extract 26 per cent, ash 7 per cent and ergosterol 0.56 per cent. Fresh yeast con-

19. Lecoq, cited by Tanner, F. W.: The "Bios" Question, Chem. Rev. 1:397 (Jan.) 1925.
20. Schultz, H.; Atkin, L., and Frey, C. N.: A Fermentation Test for Vitamin B_1, J. Amer. Chem. Soc. 59:948, 1937.
21. Prescott, S. C., and Proctor, B. E.: Food Technology, New York, McGraw-Hill Book Company, 1937, p. 507.
22. Schulein, J.: Die Bierhefe als Heil-Nähr und Futtermittel, Dresden, Theodor Steinkopff, 1935.

tains approximately 70 per cent moisture and 30 per cent total solids. According to Frey[23] the total solids are composed of the following substances: protein (N $\times$ 6.25) 52 per cent, fat 2 per cent, glycogen 30 per cent, cellulose 7 per cent and ash 9 per cent. The proteinaceous material of yeast is composed largely of monoamino and diamino acids together with smaller amounts of purine and pyrimidine bases and ammonia. The ash of yeast consists largely of phosphorus and potassium and small amounts of magnesium, calcium, silicon, sodium, sulfur, chlorine and iron. Frey reported the following analysis of the ash of yeast: phosphorus pentoxide (P_2O_5) 54 per cent, potassium oxide (K_2O) 36 per cent, magnesium oxide (MnO) 5 per cent, calcium oxide (CaO) 1 per cent, silicon dioxide (SiO_2) 2 per cent, sodium oxide (Na_2O) 1 per cent, sulfur trioxide (SO_3) 1 per cent and chlorine (Cl) and iron (Fe) less than 1 per cent each.

Nutritive Value.—The amount of protein in yeast is high. Thomas[24] determined the biologic value of yeast protein to be 70.52 per cent, placing it between that of plant and that of animal protein. Kraut and Schlottmann[25] measured the amino acid content of three samples of yeast and compared their results with the amino acid content of other protein foods. They reported that the amino acid content of yeast compares favorably with that of other protein foods. They gave the following values, expressed as percentage of total nitrogen: arginine 11, histidine 3, lysine 11, cystine 2, tryptophan 1, and tyrosine 2.5. They concluded, however, that in order to evaluate yeast as a food for man it is necessary to know what the conditions are and which plant and animal protein foods are being replaced.

Schottelius,[26] who used from 50 to 75 Gm. of yeast daily in addition to an ordinary diet, claimed that yeast is well utilized in the human body. The idea of yeast as a food protein for man and the higher animals was given renewed emphasis by the exigencies of the food situation during the World War.

In 1916 Funk and others[27] reported that yeast because of its high purine content tends to raise the uric acid level of the blood; Osborne and Mendel,[28] with diets that are now known to have been lacking in vitamin E, observed that the testes

---

23. Frey, C. N.: History and Development of Modern Yeast Industry, J. Indust. & Engin. Chem. **22**: 1154 (Nov. 1) 1930.

24. Thomas, K.: Ueber die biologische Wertigkeit der Stickstoffsubstansen im verschiedenen Nahrungsmitteln: Beiträge zur Frage nach dem physiologischen Stickstoffminimum, Arch. f. Physiol. 1909, p. 219.

25. Kraut, H., and Schlottmann, F.: Die Verwendbarkeit der Hefe als menschliches Nahrungsmittel: Der Gehalt der Hefe an den lebenswichtigen Aminosäuren, Biochem. Ztschr. **291**: 406, 1937.

26. Schottelius, M.: Untersuchungen über Nährhefe, Deutsche med. Wchnschr. **41**: 817, 1915.

27. Funk, C.; Lyle, W. G., and McCaskey, D.: The Nutritive Value of Yeast, Polished Rice, and White Bread, as Determined by Experiments on Man, J. Biol. Chem. **27**: 173 (Oct.) 1916.

28. Osborne, T. B., and Mendel, L. B.: The Nutritive Value of Yeast Protein, J. Biol. Chem. **38**: 223 (June) 1919.

of rats given a yeast-containing diet often undergo degeneration, with consequent sterility. These and other studies rather discourage the use of yeast as the sole source of protein.

The fatty components of yeast have come to have particular significance since 1924, when Steenbock and his co-workers [29] and Hess [30] independently discovered that certain foods including yeast, can be endowed with vitamin D properties by ultraviolet irradiation. Yeast is a rich source of ergosterol (provitamin D) and when irradiated becomes a good source of vitamin D.

Yeast contains many if not all of the known components of the vitamin B complex.

Funk,[31] in 1911, first pointed out that yeast is a rich source of the beriberi-curative substance. The vitamin B_1 content of commercial yeasts may be expected to vary from 15 to 42 micrograms per gram for bakers', and from 42 to 160 micrograms per gram for brewers', yeast.[1] The higher values are associated with rich mediums in which are grown relatively small crops of yeast.

Yeast in the Treatment of Pellagra.—Yeast was introduced in the treatment of pellagra by Goldberger and Tanner,[32] who used 1 Gm. of dried yeast per kilogram of body weight. Their experience led them to believe that a smaller dose is sufficient, particularly when combined with proper dietary treatment, and Goldberger, Wheeler and Tanner [33] finally recommended a daily dose of between 15 and 30 Gm. Walker and Wheeler [34] cured experimental pellagra with a daily dose of 30 Gm. of dried powdered yeast, while the patients continued to receive the deficient diet, and Wheeler [35] prevented pellagra with a daily dose of 60 Gm. of autoclaved dried bakers' yeast. Spies, Chinn and McLester [36] recently have used even larger doses (1 ounce [28 Gm.] of yeast given three or more times a day and sometimes 2 [57 Gm.] or even 3 ounces [85 Gm.] three times daily). No evidence of deleterious effects from over-

---

29. Steenbock, H., and Black, A.: The Induction of Growth Promoting and Calcifying Properties in a Ration by Exposure to Ultra-Violet Light, J. Biol. Chem. **61**: 405 (Sept.) 1924.

30. Hess, A. F.: On the Induction of Antirachitic Properties in Rations by Exposure to Light, Science **60**: 269 (Sept. 19) 1924.

31. Funk, C.: On the Chemical Nature of the Substance Which Cures Polyneuritis in Birds Induced by a Diet of Polished Rice, J. Physiol. **43**: 395 (Dec.) 1911.

32. Goldberger, J., and Tanner, W. F.: A Study of the Pellagra-Preventive Action of Dried Beans, Casein, Dried Milk and Brewers' Yeast, with a Consideration of the Essential Preventive Factors Involved, Pub. Health Rep. **40**: 54 (Jan. 9) 1925.

33. Goldberger, J.; Wheeler, G. A., and Tanner, W. F.: Yeast in the Treatment of Pellagra and Black Tongue: A Note on Dosage and Mode of Administration, Pub. Health Rep. **40**: 927 (May 8) 1925.

34. Walker, N. P., and Wheeler, G. A.: Influence on Epilepsy of a Diet Low in the Pellagra-Preventive Factor, Pub. Health Rep. **46**: 851 (April 10) 1931.

35. Wheeler, G. A.: The Pellagra-Preventive Value of Autoclaved Dried Yeast, Canned Flaked Haddock, and Canned Green Peas, Pub. Health Rep. **48**: 67 (Jan. 20) 1933.

36. Spies, T. D.; Chinn, A., and McLester, J. B.: Treatment of Endemic Pellagra, South. M. J. **30**: 18 (Jan.) 1937.

dosage with dried yeast was reported. The authors stated that it is essential that large doses be given if treatment is to be successful. The use of moist yeast cakes or compressed yeast tablets is out of the question, since a moderate daily dose of 10 grain (0.65 Gm.) tablets would be 100 tablets. Therefore, the only practical method of administration is to give the dried powdered yeast in tablespoonfuls. Anything less than this represents insufficient treatment and may lead to failure. Yeast may be conveniently stirred into milk, tomato juice or table syrup. A bouillon may be made with warm water and salt; yeast may be sprinkled on cooked cereals and has been given successfully in eggnogs.

Yeast in the Treatment of Constipation.—Yeast has been long advocated for its laxative properties. As early as 1500 B. C. the use of milk, yeast and honey was recommended for the treatment of constipation, in the Ebers Papyrus, an ancient Egyptian pharmaceutic manuscript.[37] Murlin and Mattill[38] presented a comprehensive review of the work of a number of French investigators who used yeast successfully as a corrective for both constipation and diarrhea. Murlin and Mattill also concluded from their experiments that the administration of yeast resulted not only in greater frequency of evacuation but in a measurable increase in bulk. Pierce[39] reported a laxative action in 4 healthy adults ingesting from 42 to 84 Gm. of moist yeast. Softer stools having a greater bulk were passed, and in several instances there was a pronounced effect on alimentary rate. Brown and others[40] observed the efficacy of the administration of nonfermenting yeast to 351 women and children given 6 tablets (3 Gm.) daily during a twelve month period. They reported that 83 per cent of the 113 patients with constipation, some of whom had formerly found it essential to use laxative continuously, reported improved intestinal function within two weeks after beginning ingestion of yeast. No contraindications were observed in the 351 cases.

The laxative effect of yeast is generally attributed to the increased tone of the digestive tract, especially when used in diets that are deficient in vitamin B_1 and contain an excess of carbohydrate, and to the increased moisture content of the feces.

Although yeast contains purines, it does not seem probable that, at least in the quantities ordinarily consumed, it causes an increase in production of uric acid sufficiently great to exert a harmful effect on the organism or to lead to the formation of uric acid stones.

37. The Ebers Papyrus, cited by Pierce, H. B.: The Effect of Yeast Ingestion on the Composition of the Urine and Feces, J. Biol. Chem. **98**: 509 (Nov.) 1932.

38. Murlin, J. R., and Mattill, H. A.: The Laxative Action of Yeast, Am. J. Physiol. **64**: 75 (March) 1923.

39. Pierce, H. B.: The Effects of Yeast Ingestion on the Composition of the Urine and Feces, J. Biol. Chem. **98**: 509 (Nov.) 1932.

40. Brown, F. A.; Campbell, M. B.; Stoner, N. B., and Macy, I. G.: A Study of the Therapeutic Value of Yeast, J. Am. Dietet. A. **10**: 29 (May) 1934.

The use of yeast in the diet of infants under 1 year of age has been questioned by some investigators. Daniels[41] and Davison[42] advised against the use of fresh yeast in infant feeding and reported that the addition of even small amounts resulted in diarrhea and flatulence in a large number of cases.

Other Uses of Yeast.—The use of Marmite, or Vegex, a preparation of autolyzed yeast, in the treatment of certain types of macrocytic anemia has been reported in the literature.[43] The results, however, are not uniform, and although they suggest that autolyzed yeast may be of value in the treatment of some types of pernicious anemia, the evidence is still too meager to warrant a definite statement.

Since fermented liquids, if concentrated enough have been assumed to have a bactericidal action, yeast has been proposed as a bactericide in the treatment of infections of the superficial type. Its application for this purpose, however, has been practically abandoned, although there are traditional accounts of the healing properties of fresh yeast applied to open wounds. Schught[44] reported that his research failed to demonstrate any bactericidal action from yeast unless fermentation was going on. Although fermenting yeast has bactericidal power, the small amounts used in therapeutics are almost negligible in this respect. According to Schught, the effect is felt only by bacteria which are especially susceptible to any change in the medium containing them.

There are frequent references in the literature to yeast infections and allergic reactions to inhaled yeast.[45] Biedeman went so far as to suggest that a patient's sensitivity to yeast should be appropriately tested before this substance is prescribed. He reported that a patient who was formerly able to tolerate the amount of yeast used in cooking was unable to use the same amount after ingesting for a short time a nationally advertised brand.

Allowable Claims.—The Council on Foods regards compressed fresh yeast, dried yeast and yeast extracts as foods with usefulness restricted to special purposes. These products are useful

---

41. Daniels, A. L.: Can Yeast Be Used as a Source of the Antineuritic Vitamin in Infant Feeding? Am. J. Dis. Child. **23**: 41 (Jan.) 1922.

42. Davison, W. C.: The Failure of Yeast Therapy in the Feeding of Infants, Am. J. Dis. Child. **23**: 339 (Oct.) 1932.

43. Goodall, A.: Treatment of Pernicious Anemia by Marmite, Lancet **2**: 781 (Oct. 8) 1932. Wills, L.: Nature of Hematopoietic Factor in Marmite, ibid. **1**: 1283 (June 17) 1933. Yang, C. S., and Chang, S. L.: The Treatment of Neurologic Manifestations of Pernicious Anemia, Chinese M. J. **53**: 469 (May) 1938.

44. Schught, P.: Bactericidal Action of Yeast, Monatschr. f. Geburtsh. u. Gynäk. **56**: 144 (Dec.) 1921.

45. Taub, S. J.: Asthma Due to Yeast (by Ingestion), J. Allergy **3**: 586 (Sept.) 1932. Brown, G. L.: Sensitization to Fungi, Ann. Int. Med. **6**: 655 (Nov.) 1932. Feinberg, S. M., and Little, N. T.: Studies on the Relation of Micro-Organisms to Allergy, J. Allergy **6**: 564 (Sept.) 1935. Biedeman, J. B.: Sensitivity to Ingested Yeast, J. A. M. A. **106**: 31 (Jan. 4) 1936.

for increasing the vitamin B_1 (thiamin) and G (riboflavin) content of the diet. Fresh yeast and dried yeast if taken in sufficient quantity have a mild laxative effect on many persons. Special claims for yeast products must have the approval of the Council before use in advertising.

Labels and advertising of yeast products should list the ingredients other than yeast substances and state the percentage composition in close proximity to the name of the product. The vitamin B_1 (thiamin) and G (riboflavin) content of the product as determined by biologic assay should be expressed in appropriate units.

The listed yeast products of the following firms stand accepted:

The Battle Creek Food Company, Battle Creek, Mich.

SAVITA, a viscous mixture of extracts of brewers' yeast and vegetables (parsley, leek, celery, onions and carrots), salt and saccharated iron oxide.

Analysis (submitted by manufacturer).—Moisture 26.0%, total solids 74.0%, ash 27.8%, sodium chloride (NaCl) 15.2%, fat trace, nitrogenous substances estimated as protein [46] (N $\times$ 6.25) 31.9%, crude fiber none, copper-reducing substances as dextrose 5.6%, carbohydrates (by difference) 14.3%, iron (Fe) 30 mg. per hundred grams, copper (Cu) 2.8 mg. per hundred grams, phosphoric acid as phosphorus pentoxide (P_2O_5) 5.1%.

Calories.—1.8 per gram; 51 per ounce.

Vitamins.—The manufacturer reported (1938) 65 international units of vitamin B_1 (thiamin) per gram; 45 Sherman-Bourquin units of vitamin G (riboflavin) per gram; 1846 and 1278 per ounce.

Mead Johnson & Company, Evansville, Ind.

MEAD'S BRAND BREWER'S YEAST POWDER, vacuum-packed spray-dried brewers' yeast in powder form.

MEAD'S BRAND BREWER'S YEAST IN TABLETS, vacuum-packed spray-dried brewers' yeast in 6 grain (0.39 Gm.) tablets. Glycerin is added to the tablets for a binder.

Analysis (submitted by manufacturer).—Moisture 5.0%, total solids 95.0%, ash 8.0%, fat 2.0%, protein (N $\times$ 6.25) 48.0%, crude fiber none, carbohydrates (by difference) 37%, iron (Fe) 30 mg. per hundred grams, glycerin (tablets) 5.0%.

Calories.—3.6 per gram; 102 per ounce.

Vitamins.—Biologic assays (1939) as reported by the manufacturer showed not less than 50 international units of vitamin B_1 and not less than 50 Sherman-Bourquin units of vitamin G (riboflavin) per gram of yeast powder: 20 units, respectively, per 6 grain tablet.

Red Star Yeast and Products Company, Milwaukee.

RED STAR BRAND FRESH COMPRESSED YEAST, fresh compressed yeast, starch and vegetable oil.

Analysis (submitted by manufacturer).—Moisture 68.0%, total solids 32.0%, ash 1.8%, fat 0.3%, protein (N $\times$ 6.25) 12.0%, unsaponifiable matter (largely vegetable oil) 0.1%, starch (foil-wrapped package) 9.0%, total carbohydrates (by difference) 17.9%.

Calories.—1.2 per gram; 34 per ounce.

Vitamins.—Biologic assay (1935) reported by the manufacturer showed that one cake (19 Gm.) contains approximately 19 international units of vitamin B_1 and 38 Sherman-Bourquin units of vitamin G.

46. The Nitrogen determined includes that of ammonium salts, purine and pyrimidine bases, mono and diamino acids and proteins.

E. R. Squibb & Sons, New York.

SQUIBB BRAND YEAST TABLETS, dried brewers' yeast and malted wheat germ extract (essentially maltose, dextrins and "starch intermediate products") in tablet form.

Analysis (submitted by manufacturer).—Moisture 4.0%, total solids 96.0%, ash 6.5%, protein (N $\times$ 6.25) 42.0%, fat 1.4%, crude fiber none, carbohydrates (by difference) 46.1%.

Calories.—3.7 per gram; 105 per ounce.

Vitamins.—Biologic assay (1937) reported by the manufacturer showed 50 international units of vitamin B_1 per gram, 16 units per 5 grain (0.32 Gm.) tablet. It was reported in 1938 that the riboflavin content of the yeast tablets as determined by biologic assay against crystalline riboflavin as standard was 37 micrograms of riboflavin per gram; 12 micrograms per 5 grain tablet.

CEREAL GRASS PRODUCTS

The green leaves of most plants are rich food sources of carotene (provitamin A), ascorbic acid, riboflavin and minerals. Recently attention has been centered on the green leaves of cereal grasses as a source of a heretofore unknown fat-soluble vitamin designated by Dam[47] as vitamin K, (*Koagulations-Vitamin*).

Vitamin K is a fat-soluble substance the absence of which in the diet of chickens causes the blood to become slow in clotting. It is widely distributed in nature. Green vegetables, such as cabbage, kale and spinach, are particularly rich sources of this vitamin, as are also dried alfalfa leaves, pig liver fat (nonsterol fraction), beef liver, egg yolk, fish meal, soy bean oil and tomatoes. It is present in carrot tops but lacking in the carrot.[48]

Because vitamin K is widely distributed in food and can be synthesized by bacteria it is not apt to be deficient in the human being except when bile, which appears to be necessary for its proper absorption, is lacking.

There is clinical evidence[49] that vitamin K is useful in the treatment of the hemorrhagic tendency of obstructive jaundice. It appears that vitamin K alone is not effective if bile is excluded from the intestine. In the presence of hepatic injury larger amounts of vitamin K are required to give the same results.[50] Three factors, the presence of bile in the bowel, vitamin K and liver therefore are believed to be of importance in controlling bleeding in jaundiced persons.

47. Dam, H.: The Anti-Haemorrhagic Vitamin of the Chick: Occurrence and Chemical Nature, Nature, London **135**: 563 (April 27) 1935.

48. Schønheyder, F.: The Quantitative Determination of Vitamin K, Biochem. J. **30**: 890 (May) 1936. Dam, H., and Schønheyder, F.: The Occurrence and Chemical Nature of Vitamin K, ibid. **30**: 897 (May) 1936. Almquist, H. F.: Further Studies on the Antihemorrhagic Vitamin, J. Biol. Chem. **120**: 635 (Sept.) 1937.

49. Quick, A. J.: Nature of the Bleeding in Jaundice, J. A. M. A. **110**: 1658 (May 14) 1938. Brinkhaus, K. M.; Smith, H. P., and Warner, E. D.: Prothrombin Deficiency and the Bleeding Tendency in Obstructive Jaundice in the Biliary Fistula, Am. J. M. Sc. **196**: 50 (July) 1938. Snell, A. M.; Butt, H. R., and Osterberg, A. E.: Treatment of the Hemorrhagic Tendency in Jaundice, with Special Reference to Vitamin K, Am. J. Digest. Dis. **5**: 590 (Nov.) 1938.

50. Warner, E. D.: Plasma Prothrombin: Effect of Partial Hepatectomy, J. Exper. Med. **68**: 831 (Dec.) 1938.

Another less known factor present in cereal grasses is the so-called grass juice factor. According to Kohler, Elvehjem and Hart [51] this factor is essential for the normal growth of guinea pigs. The potency of the grass juice factor varies with the stage of growth of the plant, the mature plants being much less effective than rapidly growing plants.

The listed cereal grass product of the following firm stands accepted:

American Dairies, Inc., Kansas City, Mo., product distributed by Cerophyl Laboratories, Kansas City, Mo.

CEROPHYL, a powdered dried mixture of young leaves of wheat, oats, and barley, selected and blended to maintain a uniform vitamin potency The product is packed in hermetically sealed cans under nitrogen

Analysis (submitted by manufacturer).--Moisture 8%, total solids 92%, ash 12%, fat (ether extract) 5%, protein (N × 6.25) 25%, reducing sugars (before hydrolysis) 1.6%, reducing sugars (after hydrolysis) 11.3%, carbohydrates other than crude fiber (by difference) 35%, oxalic acid 0.06%, calcium (Ca) 0.5%, phosphorus (P) 0 5%, magnesium (Mg) 0.2%, potassium (K) 0.5%, sodium (Na) 0.2%, iron (Fe) 60 mg per hundred grams, manganese (Mn) 5 mg. per hundred grams, copper (Cu) 1 mg. per hundred grams, cobalt (Co) 0 1 mg. per hundred grams.

Calories.—2.85 per gram; 81 per ounce.

Vitamins.—According to the manufacturer's report (1938), the product contains: carotene, provitamin A (chemical analysis, Peterson [52] modification of the Hart and Guilbert method), 0.5 mg. per gram; vitamin B_1 (biologic assay), 3 international units per gram; riboflavin (biologic and chemical assay), 30 micrograms per gram; ascorbic acid (chemical titration) 4 mg., equivalent to 80 international units of vitamin C, per gram. Biologic assay also showed the product to be a rich source of vitamin K and of the grass juice factor.

Cerophyl Laboratories, Kansas City, Mo. *See* American Dairies, Inc., Kansas City, Mo.

PRODUCTS ENRICHED WITH ASCORBIC ACID

Products enriched with ascorbic acid are useful for persons on special diets which are restricted in liquid and for those for whom a high vitamin C intake is indicated. Zook and Sharpless [53] found that artificial fever increases the requirement or accelerates the destruction of vitamin C.

There is also evidence that a high vitamin C intake is indicated in conditions of pregnancy and hyperthyroidism.[54]

The vitamin C product of the following firm stands accepted:

Hilker & Bletsch Company, Chicago, Cincinnati and St. Louis.

V-C-B (VITAMIN C BEVERAGE), a powdered mixture of sucrose, dextrose, concentrated fruit juice, citric acid, ascorbic acid, oil of orange and certified color.

Analysis (submitted by manufacturer).—Moisture 2.0%, total solids 98.0%, ash 0.1%, protein (N × 6.25) 0.1%, crude fiber 0.03%, carbohydrates (by difference) 97.8%, acidity 2.04%, ascorbic acid 0.36%.

---

51. Kohler, G. O.; Elvehjem, C. A., and Hart, E. B.: The Relation of the "Grass Juice Factor" to Guinea Pig Nutrition, J. Nutrition **15**: 445 (May) 1938.
52. Peterson, W. J.; Hughes, J. S., and Freeman, H. F.: Determination of Carotene in Forage: Modification of Guilbert Method, J. Indust. Engin. Chem. **9**: 71 (Feb. 15) 1937.
53. Zook, J., and Sharpless, G. R.: Vitamin C Nutrition in Artificial Fever, Proc. Soc. Exper. Biol. & Med. **39**: 233 (Nov.) 1938.
54. Lewis, R. A.: The Effect of Hyperthyroidism upon the Metabolism of Vitamin C, Bull. Johns Hopkins Hosp. **63**: 31 (July) 1938.

Calories.—3.9 per gram; 111 per ounce.

Vitamins.—3,000 mg. of ascorbic acid (63,000 international units of vitamin C) added for every 28 ounces of powdered mixture. A beverage prepared by adding ½ ounce (14 Gm.) of powder to 4 ounces (118 cc.) of water contains approximately 50 mg. of ascorbic acid (1,000 international units of vitamin C).

PRODUCTS ENRICHED WITH THIAMIN CHLORIDE

The Council on Foods has recently accepted a product enriched with thiamin chloride, which is useful in diets where a high vitamin B_1 intake is indicated.

The listed product of the following firm stands accepted:

Hilker & Bletsch Company, Chicago, Cincinnati and St. Louis.

V-B-W (VITAMIN B_1 WAFER), packaged cookies containing wheat flour, sucrose, hydrogenated fat, eggs, dextrose, dried skimmed milk, sodium chloride, baking powder, flavoring, with added thiamin chloride to furnish about 100 international units of vitamin B_1 per wafer.

Analysis (submitted by manufacturer).—Moisture 2.3%, total solids 97.7%, ash 1.0%, sodium chloride 0.58%, fat (ether extract) 11.4%, protein (N $\times$ 6.25) 6.6%, crude fiber 0.12%, carbohydrates other than crude fiber (by difference) 78.6%, calcium (Ca) 0.079%, phosphorus (P) 0.039%.

Calories.—4.4 per gram; 125 per ounce; 15 per 3.41 gram wafer. Wafer count to the pound, about 133.

Vitamins.—Reports of biologic and chemical assay submitted by the manufacturer indicate that V-B-W (Vitamin B_1 Wafer) contains not less than 100 international units of vitamin B_1 in each wafer.

FOOD PRODUCTS LOW IN CARBOHYDRATES OR CALORIES AND FOOD PRODUCTS DESIGNED TO SUPPLEMENT DIETS LOW IN CALORIES

Foods low in carbohydrate or energy value or both are useful not only when carbohydrates are restricted but when diets are restricted in energy for purposes of reducing.

These products usually are compounds of vegetables, gums, liquid petrolatum, washed bran or purified cellulose, thus furnishing bulk.

Mineral Oil in Foods.—Liquid petrolatum, or mineral oil, is practically unabsorbed from the gastrointestinal tract. It yields no calories. It possesses many of the physical properties of ordinary oils and therefore is used to some extent to replace fat in salad dressings, chiefly mayonnaise, and in a few other products.

Evidence indicates that the ingestion of liquid petrolatum results in a considerable loss of vitamin A if the oil is administered with the source of vitamin A, the effect being most marked on the absorption of carotene (provitamin A).[55] It

55. Jackson, R. W.: The Effect of Mineral Oil Administration Upon the Nutritional Economy of Fat-Soluble Vitamins: I. Studies with the Vitamin A of Butterfat, J. Nutrition 7:607 (June) 1934. Dutcher, R. A.; Harris, P. L.; Hartzler, E. R., and Guerrent, N. B.: Vitamin Studies: XIX. The Assimilation of Carotene and Vitamin A in the Presence of Mineral Oil, ibid. 8:269 (Sept.) 1934.

appears that with the amount of liquid petrolatum usually prescribed as a laxative (15 cc. from one to three times daily for adults) and under the conditions which should be observed (not to be taken at mealtime), the effect on the absorption of vitamin A probably is of little consequence. When the oil is incorporated in foods, however, so that it is taken at mealtime, there is danger of interference with absorption of carotene, vitamin A and other fat-soluble vitamins. Further, the indiscriminate use of foods containing liquid petrolatum by persons who have loose bowels may cause further looseness and thus also interfere with the utilization of water-soluble vitamins. Therefore, the Council advises against indiscriminate dosage of liquid petrolatum either alone or incorporated in special foods. Those food products containing mineral oil will be considered for acceptance as special items with limited usefulness to be taken under the direction of a physician.

Cellulose in Foods.—Washed bran, or purified cellulose, may be useful as a source of bulk in the diet of healthy persons. Danger from the use of bran or cellulose in the diet is greatest for those who have spastic colons. Particles of bran or undigestible cellulose are rough and mechanically irritate the colon to such a degree as to intensify the spasticity. For these reasons it is important that the amount of washed bran or cellulose present be declared on the label and that indiscriminate use of bran be discouraged.

Saccharin in Foods.—The reasonable addition of saccharin for the purpose of sweetening and additions of suitable flavoring ingredients may not be objectionable, but it is essential that the presence and amount of saccharin be declared on the label.

In general, artificial substitutes for ordinary foods are not favored; it is much better for the patient to learn how to plan his diet with foods in common use and readily available. The diet should be exactly prescribed as to carbohydrate, protein, fat and total calories.

"Diabetic" Foods.—The designation of a food as suitable for diabetic patients merely because it is low in carbohydrates is now unwarranted and misleading, giving the erroneous impression either that the food taken in unrestricted quantities is harmless or that it has remedial action. Except for the necessity of restricting foods to avoid overstepping the food tolerance, there are no special diabetic nutritional requirements. The exploitation of starch-free or low carbohydrate foods containing an excess of protein for use by diabetic patients is unwarranted. In diabetes protein may be tolerated almost as poorly, if not quite as poorly, as starch. Commercially prepared "diabetic foods" are of limited usefulness to the diabetic patient; furthermore, the availability of insulin makes them no longer necessary.

Restriction of carbohydrate may be beneficial in the treatment of conditions other than diabetes. Particularly is this

true in the treatment of epilepsy or of urinary infection with the so-called ketogenic diet. To be ketogenic a diet must be rigidly restricted; its content of carbohydrate may need to be less than 20 or 30 Gm. per day and that of protein not in excess of 60 Gm. The Council, therefore, has ruled that to be eligible for acceptance products designed to resemble ordinary foods, such as bread, cake and flour, for diets restricted in dextrose formers, except in cases of special adaptability, shall contain dextrose formers yielding not more than 3.3 Gm. of dextrose per hundred cubic centimeters (computing the dextrose equivalence as the carbohydrate, plus 58 per cent of the protein, plus 10 per cent of the fat content of the food).

Foods for Weight Reduction.—With the changes in the mode of living that characterize present-day urban existence, a considerable proportion of the adult population indulges in comparatively little muscular activity. Eating habits developed during adolescence, when the demands of physical activity necessitate a large food intake, may be continued after the need for a high energy intake has ceased. The result is a gradual gain in weight, not conducive to the best health. It is hard for most people to believe how a small quantity of food can influence weight. An intake of 100 calories a day above the energy expenditure means an increase in weight of about 10 pounds in a year. Reducing by increased exercise is not an easy matter, frequently is ineffective, and in some cases may even be injurious. Those who wish to get rid of accumulated body fat must eat fewer calories than they expend in activity.

Reducing in most cases can be accomplished safely only when the intake of energy is restricted without limitation of other dietary essentials. It is recommended, indeed, that the daily intake of protein, minerals and vitamins be much higher in proportion than that provided by the ordinary diet. It is possible in a variety of ways to plan a diet which will enable a person to burn accumulated body fat and at the same time be protected from the dangers of protein, vitamin or mineral deficiency, although this is difficult to do without resort to some supplementary supply of certain minerals and vitamins (principally vitamins A and B). The natural foods of which such a diet ought to be principally composed are skimmed milk, leafy vegetables prepared without fat of any kind, fruits without added sugar and lean meats.

When the foods named are obtainable with difficulty, special foods of low energy value may be used to enrich the reducing diet in protein, minerals and vitamins. These do not in the least do away with the necessity for restricting the energy intake, but they enable the person who cannot control the preparation of his own meals or does not know how to plan a diet of low caloric value rich in protein, minerals and vitamins to get a diet of higher nutritive value than would otherwise be possible. Taken in measured quantities, such special purpose

foods also serve as a daily reminder of a different dietary regimen and a defense against the solicitations of family and friends to indulge in favorite foods.

It is important that the contributions to the day's diet made by any so-called reducing food be clearly indicated. If the product is intended to replace one or two meals a day, suitable suggestions for the other meal or meals should be made. The advertising also should carry a statement that dieting to reduce is not without certain dangers and that it should be undertaken only under medical guidance.

Any foods which purport to reduce weight without alteration of the ordinary dietary program either are of little real value or contain drugs which ought not to be administered without the supervision of a physician. Such foods are considered nonacceptable.

The listed low carbohydrate products and other food preparations of the following firms stand accepted:

The Chicago Dietetic Supply House, Inc., Chicago.

CELLU BRAND BREAKFAST CRISP, a cereal substitute in dried form prepared from washed bran, commercially pure powdered cellulose, liquid petrolatum acacia, sodium chloride, sodium bicarbonate, baking powder and saccharin (not more than 1 grain [0.06 Gm.] of soluble saccharin per 7½ ounce [213 Gm.] package but omitted when sold in states forbidding its use).

Analysis (submitted by manufacturer)—Moisture 2.8%, total solids 97.2%, ash 4.2%, mineral oil 27 7%, protein (N × 6.25) 3.9%, crude fiber 22.6%, available carbohydrates (calculated as starch, diastase method) 2.3%, nonavailable carbohydrates other than crude fiber (by difference) 36.5%.

Calories.—0.3 per gram; 9 per ounce.

CELLU BRAND GELATIN DESSERTS, ASSORTED FLAVORS, unsweetened, flavored and colored granular gelatin, tartaric acid and sodium chloride. The color is certified by the United States Department of Agriculture. The flavors of the respective products are terpeneless oils of orange and lemon and true fruit extracts of raspberry, cherry and grape fortified with imitation flavors of aldehydes and esters.

Analysis (submitted by manufacturer).—Moisture 8.3%, total solids 91.7%, ash 1.6%, sodium chloride (NaCl) 0.8%, fat 0.04%, protein (N × 5.59) 66.8%, reducing sugar as dextrose 6.0%, carbohydrates (by difference) 23.3%, tartaric acid [$C_2H_2(OH)_2(COOH)_2$] 11.4%.

Calories.—3.61 per gram; 103 per ounce.

CELLU BRAND HARD GUM DROPS, ASSORTED FLAVORS, acacia water, citric acid, flavoring (true fruit raspberry flavor, oils of cassia, anise, lime, peppermint, lemon or orange or extract of horehound), saccharin (0.4 Gm. per 4 ounces [113 Gm.]) and color certified by the United States Department of Agriculture. The horehound drops contain menthol.

Analysis (submitted by manufacturer).—Moisture 10.7%, total solids 89.3%, ash 3.1%, fat 0.1%, protein (N × 6.25) 1.6%, crude fiber none, saccharin 0.09%, titratable acidity as citric acid 1.5%, alcohol-insoluble matter (gums, dextrin, etc.) 88%, pentosans (as pentose) 28.3%.

Calories.—None.

CELLU BRAND ONE-THREE-THREE SELF RISING FLOUR, a mixture of pulverized bran, corn starch, hydrogenated cottonseed oil, calcium phosphate [$CaH_4(PO_4)_2\ H_2O$], sodium bicarbonate, sodium chloride and acacia.

Analysis (submitted by manufacturer).—Moisture 5.1%, total solids 94.9%, ash 8.6%, sodium chloride (NaCl) 0.6%, fat 12.1%, protein (N × 6.25) 6.9%, starch (diastase method) 13.7%, crude fiber 14.3%, carbohydrates other than crude fiber (by difference) 53.0%.

Calories.—3.5 per gram; 99 per ounce.

CELLU BRAND WAFERS, prepared from washed bran, commercially pure powdered cellulose, liquid petrolatum, acacia, sodium chloride, baking powder, sodium bicarbonate and saccharin (except when wafers are to be sold in states prohibiting the sale of saccharin in food).

Analysis (submitted by manufacturer).—Moisture 3.4%, total solids 96.6%, ash 4.4%, liquid petrolatum 28.8%, protein (N × 6.25) 4.0%, crude fiber 22.1%, available carbohydrates (calculated as starch, diastase method) 2.0%, nonavailable carbohydrate other than crude fiber (by difference) 35 3%.

Calories.—0.2 per gram; 6 per ounce.

Curdolac Food Co., Waukesha, Wis.

CURDOLAC COMPANY BRAN, SOYA BEAN, INDIA GUM BREAKFAST PREPARATION, dried strands of a preparation of starch-free wheat bran, roasted soy bean, acacia, sodium chloride, sodium bicarbonate, saccharin, cassia extract and vanilla.

Analysis (submitted by manufacturer).—Moisture 2.0%, total solids 98.0%, ash 8.0%, fat 5.3%, protein (N × 6.25) 15.2%, crude fiber 17.9%, available carbohydrates[56] 3.6%, nonavailable carbohydrates[56] other than crude fiber (by difference) 48.0%, saccharin 0 0006%.

Calories.—1.1 per gram; 31 per ounce.

Frank's Foodless Food Company, Peekskill, N. Y.

FRANK'S DIATADE, a substitute for salad dressing containing liquid petrolatum, whole eggs, malt vinegar, sodium chloride, mustard flour, white pepper and saccharin.

Analysis (submitted by manufacturer).—Moisture (moisture and volatile matter) 13.0%, total solids 87.0%, ash 1.5%, sodium chloride (NaCl) 1.4%, liquid petrolatum 83.5%, protein (N × 6.25) 1.1%, saccharin 0.012%, titratable acidity as acetic acid 0.4%, lipoid phosphoric acid as phosphorus pentoxide (P_2O_5) 0.03%.

Calories.—0.1 per gram; 3 per ounce.

General Foods Corporation, New York, product distributed by The Jell-O Company, Inc., Le Roy, N. Y.

D-ZERTA, a dessert containing gelatin, tartaric acid, saccharin, fruit flavors (lemon and orange oils and true raspberry extract) and added natural coloring, curcumin, cochineal and orcein.

Analysis (submitted by manufacturer).—Moisture 3.0%, total solids 97.0%, ash 6.2%, fat none, protein (N × 5.55) 57.8%, saccharin 0.85%, crude fiber none, carbohydrates none, sodium citrate ($2Na_3C_6H_5O_7$) less ash, 32.15%.

Calories.—2.3 per gram; 65 per ounce.

The Jell-O Company, Inc., Le Roy, N. Y. *See* General Foods Corporation, New York.

Arthur E. Shannon, Columbus, Ohio.

BO-PO'S BRAND DIETARY DRESSING, containing liquid petrolatum, vinegar, sodium chloride, mustard, paprika, Worcestershire sauce, tabasco sauce and saccharin. Seasoned with garlic.

Analysis (submitted by manufacturer).—Moisture 12.2%, total solids 87.8%, ash 3.1%, liquid petrolatum 83.6%, protein (N × 6.25) 0.8%, sucrose none, reducing sugars none, crude fiber 0.28%, total carbohydrates 0.35%.

Calories.—Practically none.

---

56. Estimated from composition of ingredients and formula.

Dietene Company, Minneapolis.

DIETENE, a powdered mixture of skimmed milk powder, sugar, soluble calcium caseinate, cocoa, wheat embryo, dried whole egg, dried brewers' yeast, sodium chloride, karaya gum, concentrate of vitamins A and D from cod liver oil, seasoning and artificial flavoring (dried toffee extract, ethavan[57] and coumarin).

Analysis (submitted by manufacturer).—Moisture 4.6%, total solids 95.4%, ash 5.2%, fat 4.0%, protein (N × 6.38) 36.1%, crude fiber 0.6%, karaya gum 1.2%, carbohydrates other than crude fiber and gum 48.3%, sodium chloride (NaCl) 1.6%, calcium (Ca) 0.86%, phosphorus (P) 0.86%, iron (Fe) 4.5 mg. per hundred grams.

Calories.—3.74 per gram; 106 per ounce.

Vitamins.—Biologic assays (1937) reported by the manufacturer showed 35 U.S.P. units of vitamin A, 2.3 international units of vitamin B_1 per gram, 1.6 U.S.P. units of vitamin D and 4.24 Sherman-Bourquin units of vitamin G per gram; 994, 65, 45 and 120 units, respectively, per ounce.

CANNED FRUITS AND VEGETABLES, JUICE OR WATER PACKED, WITHOUT ADDED SUGAR OR SALT

Although the use of insulin now permits including almost all natural foods in the diet of a person with diabetes, it still is necessary to regulate the intake of sugar and starch so that it will be approximately the same from day to day. This is because the dose of insulin required cannot be estimated correctly without knowledge of the amount of carbohydrate to be used. Standard diet lists provide the information necessary about the composition of unprocessed foods. They do not and cannot help when it comes to canned fruits and vegetables, because in the usual processing sugar may be added in amounts that vary from 20 to 50 per cent of the contents of the can or container.

Similarly, in the treatment of certain other diseases control of intake of sodium chloride is desirable, and if ordinary canned fruits or vegetables are used the physician or patient has no way of knowing how much, if any, sodium chloride has been added to the food in processing. Therefore, fruits and vegetables, juice or water packed, without added sugar or salt are of value as special purpose foods. Those labeled "water packed" contain water as the only added ingredient. Those labeled "juice packed" (fruits, tomatoes) are packed in pure juice expressed from the fruit. The extra juice increases palatability and adds to the nutritive value.

Labels and Advertising of Water and Juice Packed Fruits and Vegetables.—Claims consistent with these statements are permitted in the labeling and advertising of water and juice packed fruits and vegetables. In accepted products of this kind the label shall provide information about the number of calories per gram or ounce and the number of grams each of total carbohydrate, available carbohydrate, protein and fat per hundred grams of fruit or vegetable and liquid.

---

57. Ethavan is a trade name for ethyl vanillin and is, chemically, ethyl protocatechiua aldehyde; it has relatively three times the flavoring strength of vanillin.

The United States Department of Agriculture [58] under the authority conferred by the amendment of July 8, 1930, to the Federal Food and Drugs Act (section 8, paragraph 5) has established standards for all canned foods. Canned fruits and vegetables which meet the standards of quality and condition in every respect except that they are packed in water must bear a special statement showing that fact, such as "water pack pears." This statement must appear below the name of the product in a rectangular box with a solid border not less than 6 points in width. The special statement must be printed on a strongly contrasting uniform background, in capitals of a size not less than 12 point boldface for containers under 1 pound net weight and not less than 14 point boldface for containers of 1 pound net weight or over.

The composition of accepted canned products is given in the table.

The listed products of the following firms stand accepted:

The Battle Creek Food Company, Battle Creek, Mich.

SANITARIUM BRAND PINEAPPLE SLICED, water packed.
SANITARIUM BRAND PINEAPPLE TIDBITS, water packed
SANITARIUM BRAND GRAPEFRUIT JUICE.
SANITARIUM BRAND PINEAPPLE JUICE
SANITARIUM BRAND PINEAPPLE SLICES, juice packed
SANITARIUM BRAND PINEAPPLE TIDBITS, juice packed.

The Chicago Dietetic Supply House, Inc., Chicago.

CELLU BRAND APPLE JUICE.
CELLU BRAND APPLE SAUCE, water packed
CELLU BRAND APPLE RINGS, juice packed.
CELLU BRAND JUICE-PAK APRICOTS,
CELLU BRAND APRICOT JUICE.
CELLU BRAND APRICOTS, water packed.
CELLU BRAND GREEN CUT ASPARAGUS, water packed.
CELLU BRAND TIPS OF ASPARAGUS, water packed.
CELLU BRAND GREEN STRINGLESS BEANS, water packed.
CELLU BRAND YELLOW STRING BEANS, water packed.
CELLU BRAND TINY BEETS, water packed.
CELLU BRAND BLACKBERRIES, water packed.
CELLU BRAND BLACKBERRY JUICE.
CELLU BRAND JUICE-PAK BLUEBERRIES.
CELLU BRAND CARROTS, water packed.
CELLU BRAND CARROT JUICE.
CELLU BRAND CAULIFLOWER, water packed.
CELLU BRAND JUICE-PAK RED PITTED CHERRIES.
CELLU BRAND RED PITTED CHERRIES, water packed.
CELLU BRAND RED CHERRY JUICE.
CELLU BRAND JUICE-PAK ROYAL ANNE CHERRIES
CELLU BRAND ROYAL ANNE CHERRIES, water packed.
CELLU BRAND LITTLE KERNEL CORN, water packed.
CELLU BRAND FRUIT COCKTAIL, juice packed.
CELLU BRAND 10% FRUIT SALAD COMBINATION, water packed.
CELLU BRAND THOMPSON SEEDLESS GRAPES, water packed.
CELLU BRAND GRAPEFRUIT, Juice packed.
CELLU BRAND GRAPEFRUIT, water packed.
CELLU BRAND GRAPEFRUIT JUICE.
CELLU BRAND KADOTA FIGS, water packed.
CELLU BRAND LOGANBERRIES, water packed.

58. Service and Regulatory Announcements, Food and Drug No. 4, fourth revision, United States Department of Agriculture, Food and Drug Administration, September 1937.

CELLU BRAND LOGANBERRY JUICE.
CELLU BRAND MUSHROOMS, water packed.
CELLU BRAND ORANGE JUICE.
CELLU BRAND JUICE-PAK YELLOW CLING PEACHES.
CELLU BRAND YELLOW CLING PEACHES, water packed.
CELLU BRAND PEACH JUICE
CELLU BRAND JUICE-PAK BARTLETT PEARS.
CELLU BRAND BARTLETT PEARS, water packed.
CELLU BRAND PEAR JUICE.
CELLU BRAND PEAS, water packed.
CELLU BRAND JUICE-PAK PINEAPPLE SLICED.
CELLU BRAND JUICE-PAK PINEAPPLE CRUSHED.
CELLU BRAND PINEAPPLE SLICED, water packed.
CELLU BRAND PINEAPPLE JUICE.
CELLU BRAND PRUNE PLUMS, water packed.
CELLU BRAND PRUNE PLUM JUICE.
CELLU BRAND BLACK RASPBERRIES, water packed
CELLU BRAND JUICE-PAK RED RASPBERRIES.
CELLU BRAND RED RASPBERRIES, water packed.
CELLU BRAND RED RASPBERRY JUICE
CELLU BRAND RHUBARB, water packed.
CELLU BRAND SPINACH, water packed.
CELLU BRAND JUICE-PAK STRAWBERRIES.
CELLU BRAND STRAWBERRIES, water packed.
CELLU BRAND TOMATOES, water packed.
CELLU BRAND TOMATO JUICE.
CELLU BRAND VEGETABLE COMBINATION, water packed.

Hawaiian Pineapple Company, San Francisco.
DOLE BRAND HAWAIIAN PINEAPPLE SLICED, juice packed.
DOLE BRAND HAWAIIAN PINEAPPLE SLICED, water packed.
DOLE BRAND HAWAIIAN PINEAPPLE TIDBITS, water packed

Nutradiet Company, San Francisco. *See* **S & W Fine Foods, Inc.**

The Reynolds Preserving Company, Sturgeon Bay, Wis.
REYNOLD'S BRAND PITTED RED CHERRIES, water packed.
REYNOLD'S STURGEON BAY BRAND PITTED RED CHERRIES, water packed.
REYNOLD'S CHERRYLAND BRAND PITTED RED CHERRIES, water packed.

John Sexton & Co., Chicago.
SEXTON BRAND APPLE SAUCE, juice packed.
SEXTON BRAND APRICOTS, juice packed.
SEXTON BRAND FRESH GREEN ASPARAGUS, water packed.
SEXTON BRAND GOLDEN WAX BEANS, water packed.
SEXTON BRAND GREEN REFUGEE BEANS, water packed.
SEXTON BRAND LIMA BEANS, water packed.
SEXTON BRAND WHOLE BEETS, water packed
SEXTON BRAND BLACKBERRIES, juice packed.
SEXTON BRAND BLUEBERRIES, juice packed.
SEXTON BRAND BLACK CHERRIES, juice packed.
SEXTON BRAND RED PITTED CHERRIES, juice packed.
SEXTON BRAND ROYAL ANNE CHERRIES, juice packed.
SEXTON BRAND FRUIT FOR SALAD, water packed.
SEXTON BRAND GRAPEFRUIT, water packed.
SEXTON BRAND LOGANBERRIES, juice packed.
SEXTON BRAND YELLOW CLING PEACHES, juice packed.
SEXTON BRAND BARTLETT PEARS, juice packed.
SEXTON BRAND SWEET WRINKLED PEAS, water packed.
SEXTON BRAND HAWAIIAN PINEAPPLE CRUSHED, juice packed.
SEXTON BRAND HAWAIIAN PINEAPPLE SLICED, juice packed.
SEXTON BRAND PRUNE PLUMS, juice packed.
SEXTON BRAND BLACK RASPBERRIES, water packed.
SEXTON BRAND RED RASPBERRIES, juice packed.
SEXTON BRAND STRAWBERRIES, juice packed.
SEXTON BRAND SPINACH, water packed.
SEXTON BRAND TOMATOES, juice packed.

Composition of Canned Fruits and Vegetables, Juice or Water Packed, Without Added Sugar or Salt, and of Canned Fruit and Vegetable Juices Packed Without Added Water, Sugar or Salt (Submitted by Manufacturers)

Products	Moisture, %	Total Solids, %	Ash, %	Fat,* %	Protein, (N × 6.25), %	Crude Fiber, %	Carbohydrates,† %	Calories Per Gm.	Calories Per Oz.
Battle Creek Food Co.									
Sanitarium Brand									
Pineapple, Sliced, W. P.‡	85.6	14.4	0.4	0.02	0.8	0.3	13.4	0.55	16
Pineapple, Tidbits, W. P.	88.0	12.0	0.3	0.02	0.3	0.2	11.2	0.46	13
Pineapple, Sliced, J. P.	83.5	16.5	0.5	0.0	0.4	0.3	14.4	0.63	17
Pineapple, Tidbits, J. P.	83.5	16.5	0.5	0.0	0.4	0.3	14.4	0.63	17
Sanitarium Brand Fruit Juices									
Grapefruit Juice	89.8	10.2	0.3	0.1	0.6	0.1	9.0	0.39	11
Pineapple Juice	85.3	14.7	0.4	0.3	0.3	0.0	0.4	0.59	17
The Chicago Dietetic Supply House, Inc.									
Celiu Brand Fruits									
Apple sauce, W. P.	89.4	10.6	0.2	0.3	0.3	0.8	9.0	0.40	11
Apple Rings, W. P.	87.4	12.6	0.2	0.3	0.1	1.0	11.0	0.55	16
Apricots, J. P.§	87.3	12.7	0.7	0.2	0.4	0.5	10.9	0.47	13
Apricots, W. P.	91.7	8.8	0.3	0.1	0.6	0.3	7.0	0.31	9
Blackberries, W. P.	89.0	11.0	0.4	0.8	1.0	2.0	6.8	0.38	11
Blueberries, J. P.	86.9	13.1	0.4	0.6	0.7	1.5	9.9	0.48	14
Cherries, Red Pitted, J. P.	84.2	15.8	0.4	0.8	0.8	0.2	13.6	0.65	18
Cherries, Red Pitted, W. P.	88.0	12.0	0.4	0.5	0.6	0.1	10.4	0.49	14
Cherries, Royal Anne, J. P.	84.7	15.3	0.5	0.1	0.8	0.2	13.7	0.59	17
Cherries, Royal Anne, W. P.	89.3	10.7	0.3	0.5	0.6	0.1	9.2	0.44	13
Figs, Kadota, W. P.	87.5	12.5	0.4	0.05	0.5	0.8	10.8	0.46	13
Fruit Cocktail, J. P.	89.1	10.9	0.3	0.3	0.4	0.4	9.5	0.42	12
Fruit Salad Combination (10%), W. P.	90.0	10.0	0.3	0.1	0.8	0.6	8.7	0.37	11
Grapefruit, J. P.	90.8	9.2	0.3	0.1	0.5	0.2	8.1	0.35	10
Grapefruit, W. P.	93.2	6.8	0.3	0.5	0.5	0.2	5.3	0.28	8
Grapes, Thompson Seedless, W. P.	88.5	11.5	0.2	0.7	0.4	0.2	10.0	0.48	14
Loganberries, W. P.	89.2	10.8	0.4	0.6	1.0	2.0	6.8	0.37	11
Peaches, Yellow Cling, J. P.	90.1	9.9	0.4	0.2	0.3	0.3	8.7	0.38	11
Peaches, Yellow Cling, W. P.	92.9	7.1	0.3	0.1	0.2	0.2	6.3	0.27	8
Pears, Bartlett, J. P.	87.6	12.4	0.3	0.1	0.2	0.7	11.6	0.48	14
Pears, Bartlett, W. P.	92.1	7.9	0.2	0.2	0.3	1.1	6.1	0.27	8

Pineapple, Crushed, J. P.	83.1	16.9	0.3	0.02	0.6	0.4	15.6	0.65	18
Pineapple, Sliced, J. P.	84.9	15.1	0.4	0.1	0.5	0.6	12.6	0.53	15
Pineapple, Sliced, W. P.	86.5	13.5	0.4	0.1	0.3	0.3	11.5	0.48	14
Plums, Prune, W. P.	89.4	10.6	0.3	0.1	0.5	0.2	9.5	0.41	12
Raspberries, Black, W. P.	84.9	15.1	0.6	1.1	1.1	3.3	9.0	0.50	14
Raspberries, Red, J. P.	85.6	14.4	0.5	1.2	1.0	2.3	9.4	0.52	15
Raspberries, Red, W. P.	88.2	11.8	0.5	0.9	0.8	2.1	7.5	0.41	12
Strawberries, J. P.	89.8	10.2	0.4	0.8	1.0	0.9	7.1	0.40	11
Strawberries, W. P.	91.1	8.9	0.5	0.6	0.9	1.3	5.6	0.31	9
Cellu Brand Vegetables									
Asparagus, Green Cut, W. P.	95.1	4.9	0.6	0.2	1.5	0.7	1.9	0.15	4
Asparagus, Tips, W. P.	93.8	6.2	0.9	0.1	1.7	0.6	2.9	0.19	5
Beans, Green Stringless, W. P.	95.0	5.0	0.8	0.1	1.0	0.5	2.6	0.15	4
Beans, Yellow String, W. P.	94.8	5.2	0.7	0.1	0.9	0.4	3.1	0.17	5
Beets, Tiny, W. P.	87.2	12.8	1.1	0.2	1.6	0.9	9.0	0.44	12
Carrots, W. P.	90.3	9.7	0.8	0.3	1.0	1.0	6.6	0.33	9
Cauliflower, W. P.	95.1	4.9	0.5	0.4	1.1	0.7	2.2	0.17	5
Combination, Vegetable, W. P.	89.5	10.5	1.3	0.2	2.0	0.8	6.2	0.35	10
Corn, Little Kernel, W. P.	84.9	15.1	0.5	0.7	1.8	0.5	11.6	0.60	17
Mushrooms, W. P.	93.6	6.4	0.6	0.2	1.9	0.4	3.3	0.23	7
Peas, W. P.	88.7	11.3	0.4	0.2	3.1	0.8	6.8	0.41	12
Rhubarb, W. P.	94.8	5.2	0.7	0.7	0.5	1.0	2.3	0.18	5
Spinach, W. P.	93.4	6.6	0.8	0.4	2.1	0.9	2.4	0.22	6
Tomatoes, W. P.	94.6	5.4	0.5	0.4	0.8	0.5	3.2	0.20	6
Cellu Brand Fruit and Vegetable Juices									
Apple Juice	88.5	11.5	0.1	0.2	0.04	...	11.2	0.47	13
Apricot Juice	88.4	11.6	0.5	0.4	0.5	0.04	10.2	0.46	13
Blackberry Juice	85.4	14.6	0.4	0.6	0.1	0.02	13.5	0.60	17
Carrot Juice	93.2	6.8	0.3	0.2	0.3	0.03	6.0	0.27	8
Cherry Juice, Red	87.7	12.3	0.3	0.6	0.5	...	10.9	0.51	14
Grapefruit Juice	92.2	7.8	0.2	0.4	0.4	0.0	6.8	0.33	9
Loganberry Juice	90.0	10.0	0.4	1.0	0.2	0.02	8.4	0.43	12
Orange Juice	85.9	14.1	0.4	0.1	1.1	0.0	11.5	0.51	14
Peach Juice	88.7	11.3	0.4	0.4	0.4	0.04	10.1	0.46	13

* Ether extract.
† Other than crude fiber (by difference).
‡ W. P. indicates water packed.
§ J. P. indicates juice packed.

Composition of Canned Fruits and Vegetables, Juice or Water Packed, Without Added Sugar or Salt, and of Canned Fruit and Vegetable Juices Packed Without Added Water, Sugar or Salt (Submitted by Manufacturers)—Continued

Products	Moisture, %	Total Solids, %	Ash, %	Fat,* %	Protein, (N × 6.25), %	Crude Fiber, %	Carbohydrates,† %	Calories Per Gm.	Calories Per Oz.
The Chicago Dietetic Supply House, Inc.									
Cellu Brand Fruit and Vegetable Juices—Continued									
Pear Juice	87.6	12.4	0.3	0.5	0.3	0.04	11.3	0.51	14
Pineapple Juice	85.3	14.7	0.4	0.3	0.3	0.0	0.4	0.59	17
Prune Plum Juice	85.8	14.2	0.3	0.5	0.3	0.1	13.0	0.58	16
Raspberry Juice, Red	90.6	9.4	0.4	0.1	0.3	...	8.6	0.37	11
Tomato Juice	94.4	5.6	0.4	0.3	1.0	0.2	3.7	0.22	6
Hawaiian Pineapple Co., Ltd.									
Dole Brand Hawaiian									
Pineapple, J. P. (sliced)	83.5	16.5	0.5	0.02	0.4	0.3	14.4	0.59	17
Pineapple, W. P. (sliced)	85.6	14.4	0.4	0.02	0.3	0.3	13.4	0.55	16
Pineapple, W. P. (tidbits)	88.0	12.0	0.3	0.02	0.3	0.2	11.2	0.46	13
Reynolds Preserving Co.									
Reynolds' Sturgeon Bay Brand									
Reynolds' Brand									
Reynolds' Cherryland Brand									
Cherries, Red Pitted, W. P.	88.0	12.0	0.4	0.5	0.6	0.1	10.4	0.49	14
John Sexton & Co.									
Sexton Brand Fruits									
Apple Sauce, J. P.	87.7	12.3	0.2	0.2	0.2	0.46	10.2	0.43	12
Apricots, J. P.	86.2	13.8	0.7	0.1	0.6	0.4	12.0	0.51	14
Blackberries, J. P.	88.0	12.0	0.5	0.1	0.8	3.5	7.1	0.41	12
Blueberries, J. P.	88.9	11.1	0.2	0.4	0.4	1.1	9.0	0.41	12
Cherries, Black, J. P.	81.1	18.9	0.5	0.1	0.5	0.1	17.7	0.74	21
Cherries, Red Pitted, J. P.	87.4	12.6	0.5	1.0	1.0	0.14	10.0	0.53	15
Cherries, Royal Anne, J. P.	82.6	17.4	0.6	0.1	1.0	0.2	15.5	0.67	19
Fruit for Salad, W. P.	90.3	9.7	0.2	1.0	0.4	0.34	7.8	0.42	12
Grapefruit, J. P.	91.4	8.6	0.3	0.2	0.6	0.14	7.4	0.34	10
Loganberries, J. P.	86.7	13.3	4.4	0.1	0.8	2.1	9.9	0.44	12
Peaches, Yellow Cling, J. P.	89.0	11.0	0.5	Trace	0.5	0.2	9.8	0.41	12

Pears, Bartlett, J. P.	87.0	13.0	0.3	0.1	0.2	0.5	11.9	0.49	14
Pineapple, Hawaiian, Crushed, J. P.	83.1	16.9	0.3	Trace	0.6	0.4	15.6	0.65	18
Pineapple, Hawaiian, Sliced, J. P.	83.7	16.3	0.4	Trace	0.4	0.3	15.2	0.62	18
Plums, Prune, J. P.	79.9	20.1	0.6	0.1	0.5	0.2	18.7	0.78	22
Raspberries, Black, W. P.	88.6	11.4	0.2	1.1	1.1	3.2	5.8	0.38	11
Raspberries, Red, J. P.	84.9	15.1	0.4	0.1	0.7	2.5	11.4	0.49	14
Strawberries, J. P.	87.5	12.5	0.5	Trace	0.6	0.7	10.7	0.45	13
Sexton Brand Vegetables									
Asparagus, Green, Fresh, W. P.	93.7	6.3	0.5	0.2	2.3	0.41	2.9	0.23	7
Beans, Green Refugee, W. P.									
Beans, Golden Wax, W. P.	95.1	4.9	0.4	0.7	1.0	0.51	2.3	0.20	6
Beans, Lima, W. P.	82.1	17.9	0.8	0.4	3.6	1.26	11.8	0.65	18
Beets, Whole, W. P.	87.2	12.8	0.5	0.1	1.5	0.92	9.8	0.46	13
Peas, Sweet Wrinkled, W. P.	87.6	12.4	0.4	0.4	3.7	1.18	6.7	0.45	13
Spinach, W. P.	90.9	9.1	1.2	0.3	3.5	1.04	3.1	0.29	8
Tomatoes, J. P.	93.9	6.1	0.5	0.5	1.1	0.30	3.9	0.25	7
S & W Fine Foods, Inc., The Nutradiet Co.									
Nutradiet Brand Fruits									
Applesauce	87.1	12.9	0.2	0.04	0.2	0.5	11.5	0.47	13
Apricots, Peeled, W. P.	92.2	7.8	0.4	0.06	0.4	0.3	6.0	0.26	7
Apricots, Unpeeled, W. P.	90.4	9.6	0.4	0.07	0.5	0.3	7.6	0.33	9
Blackberries, J. P.	86.4	13.6	0.3	0.5	0.9	2.1	9.3	0.45	13
Cherries, Royal Anne, W. P.	86.2	13.8	0.3	0.03	0.6	0.15	12.3	0.52	14
Figs, Delphia, W. P.	87.4	12.6	0.3	0.2	0.5	0.7	10.8	0.47	13
Grapefruit, W. P.	90.0	10.0	0.4	0.1	0.8	0.1	8.6	0.39	11
Peaches, Yellow Cling, Halved and Sliced, W. P.	93.1	6.9	0.2	0.1	0.3	0.23	5.8	0.25	7
Pears, Bartlett, Halved and Quartered, W. P.	90.3	9.7	0.2	0.07	0.2	0.6	8.5	0.35	10
Prunes, W. P.	61.6	38.4	1.1	0.1	1.3	0.7	35.2	1.47	42
Nutradiet Brand Fruit and Vegetable Juices									
Grapefruit Juice	89.8	10.2	0.3	0.1	0.6	0.1	9.0	0.39	11
Pineapple Juice	85.3	14.7	0.4	0.3	0.3	0.0	0.4	0.59	17
Tomato Juice	93.3	6.7	0.5	0.1	1.1	0.2	4.3	0.22	6
Nutradiet Brand Vegetables									
Asparagus, Green, W. P.	93.3	6.7	0.4	0.2	2.8	0.6	2.7	0.24	7
Beans, Fresh Green Baby Lima, W. P.	80.9	19.1	0.7	0.3	4.7	1.0	12.4	0.71	20
Beans, Small Whole Stringless, W. P.	95.6	4.4	0.4	0.1	1.4	0.4	2.1	0.15	4
Beets, Whole Red, W. P.	81.7	18.3	0.5	0.1	0.7	0.5	16.5	0.70	20
Spinach, W. P.	92.1	7.9	0.7	0.4	3.2	0.9	2.6	0.27	7

S & W Fine Foods, Inc., San Francisco, products distributed by Nutradiet Company, San Francisco.
NUTRADIET BRAND APPLESAUCE.
NUTRADIET BRAND APRICOTS PEELED, water packed.
NUTRADIET BRAND APRICOTS UNPEELED, water packed.
NUTRADIET BRAND GREEN ASPARAGUS, water packed.
NUTRADIET BRAND BLACKBERRIES, juice packed.
NUTRADIET BRAND SMALL WHOLE STRINGLESS BEANS, water packed.
NUTRADIET BRAND FRESH GREEN BABY LIMA BEANS, water packed.
NUTRADIET BRAND WHOLE RED BEETS, water packed.
NUTRADIET BRAND ROYAL ANNE CHERRIES, water packed.
NUTRADIET BRAND DELPHIA FIGS, water packed.
NUTRADIET BRAND GRAPEFRUIT, juice packed.
NUTRADIET BRAND GRAPEFRUIT JUICE.
NUTRADIET BRAND YELLOW CLING PEACHES HALVED, water packed.
NUTRADIET BRAND YELLOW CLING PEACHES SLICED, water packed.
NUTRADIET BRAND BARTLETT PEARS HALVED, water packed.
NUTRADIET BRAND BARTLETT PEARS QUARTERED, water packed.
NUTRADIET BRAND PINEAPPLE JUICE.
NUTRADIET BRAND PRUNES, water packed.
NUTRADIET BRAND SPINACH, water packed.
NUTRADIET BRAND TOMATO JUICE.

DRIED VEGETABLE PRODUCTS

The dried vegetable products that stand accepted are dried spinach in powder and tablet form and a combination of dried legumes and cereals. The latter product is listed and described in Section VI, Preparations Used in the Feeding of Infants.

The spinach product is prepared from fresh, selected hand picked spinach. The spinach is trimmed, washed, dried at a temperature of 66 C. in inert gas, largely carbon dioxide, pulverized and screened. The powder of desired fineness is mechanically packed in glass jars.

The tablets are made by mixing a small amount of agar, gelatin or acacia gum, or both, and stearic acid to permit molding and powdered spinach. The tablets are coated with sugar, colored with a U. S. Department of Agriculture certified color. Each tablet contains 0.4 Gm. of powdered spinach and 0.2 Gm. of sugar coating.

The listed products of the following firms stand accepted:

Du Barry and Company, San Francisco.
DU BARRY'S FOOD. For description of this product see Section VI Preparations Used in the Feeding of Infants.

The Spintrate Company, Little Mountain, S. C.
SPINTRATE, a powdered dried spinach.

Analysis (submitted by manufacturer).—Moisture 7.9%, total solids 92.1%, ash 13.6%, fat (ether extract) 4.5%, protein (N × 6.25) 31.5%, crude fiber 8.4%, carbohydrates other than crude fiber (by difference) 34.1%, calcium (Ca) 1.07%, phosphorus (P) 0.64%, iron (Fe) 53 mg. per hundred grams, copper (Cu) 1. mg. per hundred grams, manganese (Mn) 14 mg. per hundred grams, iodine (I) 0.07 mg. per hundred grams, potassium (K) 4.5%, magnesium (Mg) 0.4%, sodium (Na) 2.2%, sulfur (S) 0.4%.

Calories.—3.0 per gram; 85 per ounce.

Vitamins.—It was reported in 1932 that Spintrate contains 211 Sherman (158 international) units of vitamin A per gram; and 2.1 Sherman units of vitamin B complex per gram; 6,000 and 60 per ounce.

SPINTRATE TABLETS, candy-coated powdered spinach tablets containing powdered spinach, agar, gelatin or acacia gum, and stearic acid. The candy coating is sugar colored with United States Department of Agriculture certified color and contains 0.15 grams dicalcium phosphate ($CaHPO_4 2H_2O$). Each tablet contains 0.4 Gm. of powdered spinach and 0.2 Gm. of sugar coating.

Analysis (submitted by manufacturer).—Moisture 6.0%, total solids 94.0%, ash 10.7%, fat (ether extract) 1.4%, protein (N × 6.25) 20.4%, crude fiber 5.5%, carbohydrates other than crude fiber (by difference) 56.0%, each tablet is calculated to contain 0.0388 gram calcium, 0.0296 gram phosphorus and 0.21 mg. iron.

Calories.—3.2 per gram; 91 per ounce; 1.92 per tablet.

Vitamins.—According to report submitted by manufacturer in 1932, one Spintrate tablet contains about 63 international units of vitamin A and 0.8 Sherman units of vitamin B complex.

SECTION X

Sugars and Syrups

Sugar and syrups are useful as sweetening agents. Their only nutritional value lies in their calories. One pound of sugar furnishes about 1,800 calories. The yearly per capita consumption of sugar in the United States amounts to about 100 pounds, which means that about one fourth of the energy requirement is being met by this pure carbohydrate. For this reason it is important that special consideration be given to the inclusion of adequate amounts of other foods, which provide protein, minerals and vitamins.

Sweets in the Diet, Especially of Children.—Sweets consisting essentially of sugars are likely to be taken in excess because of their very sweetness. Adequate nutrition of children and adults requires careful selection of foods as to both kind and quantity. A well balanced diet, including ample proteins, fats, carbohydrates, minerals, vitamins and roughage, is one of the prime requisites for growth and health. Although sweets may be wholesome and even valuable foods, they contribute none of the structural components required for good nutrition. Common concentrated sweets used to excess are harmful, especially in the case of children, in that they impair the appetite for other highly necessary foods and lead to reduced intake of milk, eggs, fruits, vegetables, meat and cereals. Advertising of foods that obscures the facts of good nutrition by encouraging too liberal use of sweets should be condemned.

SUCROSE

Sucrose ($C_{12}H_{22}O_{11}$) is distributed widely in plants, but practically all of the sugar of this type available in commerce is derived from the sugar cane or the sugar beet. In general the processing of white sugar from the sugar cane or beet involves five operations: extraction of the juice, purification of the juice by adding lime and heating, evaporation to a syrupy consistency, concentration of the syrup in vacuum to a point at which crystals will form and, finally, separation of raw sugar as crystals from the mother liquid. The liquid remaining is called molasses; that derived from refining of cane sugar is distributed as molasses for human consumption, but the molasses from refining of beet sugar usually is used for the preparation of cattle feeds.

Most of the raw sugar from either beets or sugar cane goes to the refinery to be converted to white sugar. The refining

process removes even more of the molasses, the coloring matter and whatever nonsugar impurities are present. In general terms, the process consists of dissolving the raw sugar and adsorbing the color and the nonsugar impurities with the aid of charcoal. The sugar is then crystallized from the solution; it is possible to obtain a product that is more than 99.9 per cent sucrose.

Chemically there is no difference between cane and beet sugars. They have the same molecular weight and an identical formula. They also have similar physical properties, such as solubility, color and taste. Both cane sugar and beet sugar are made up of dextrose and levulose. The relative sweetness of these respective sugars is given in the following values: sucrose, 100; dextrose, 74, and levulose, 173.[1] If sweetness is the quality most desired, more dextrose must be used in a food mixture to produce the effect than either levulose or sucrose. Under certain conditions this property may be an advantage; under others, a disadvantage.

The sugar obtained from the sugar cane and the sugar beet is distributed largely as white sugar. However, smaller quantities of refined white sugar are specially prepared and distributed as powdered sugar and confectioners' sugar. Powdered confectioners' sugar is usually prepared by pulverizing crystalline white sugar and adding 3 per cent corn starch to prevent caking. This product is useful in the preparation of uncooked frostings for cakes and in the manufacture of various confections. Confectioners' sugar differs from ordinary granulated sugar only in the smaller size of the sugar crystal and the presence of a small amount of starch.

A small amount of raw cane sugar is packaged and sold as one type of brown sugar. This sugar is about 97 per cent sucrose. The rest consists of water, mineral salts and nonsugar substances that were derived from the cane juice, which give the product a characteristic color and flavor. The amount of mineral salts in this type of brown sugar is variable and never large enough to justify any nutritional claims.

The brown sugar usually found in commerce is a partially refined product. The moist soft sugar is cooled and graded according to the degree of color of the finished product. Darker sugars contain less sucrose and correspondingly greater amounts of ash. The sucrose content of accepted brands of brown sugar ranges from 85 to 92 per cent and the mineral content from 0.5 to 1.5 per cent. The moisture content is about 4 per cent. This type of brown sugar is valued for the characteristic flavor it imparts to foods. All the brands of brown sugar that stand accepted by the Council are of this type.

---

1. Beister, A.; Wood, M. W., and Wahlin, C. S.: Carbohydrate Studies: I. The Relative Sweetness of Pure Sugars, Am. J. Physiol. **73**: 387 (July) 1925.

The listed products [2] of the following firms stand accepted:

The W. J. McCahan Sugar Refining & Molasses Co., Philadelphia.

McCAHAN'S SUNNY BRAND CANE SUGAR, CONFECTIONERS XXXX, refined cane sugar.

Analysis (submitted by manufacturer).—Moisture 0.1%, total solids 99.9%, ash 0.005%, fat none, protein (N × 6.25) none, sucrose (polarimetric method) 99.7 to 99.9%.

Calories.—4 per gram; 114 per ounce.

McCAHAN'S SUNNY BRAND CANE SUGAR, CONFECTIONERS XXXX, powdered refined cane sugar admixed with 3 per cent corn starch (starch U.S.P.) to prevent caking.

Analysis (submitted by manufacturer).—Moisture 0.3%, total solids 99.7%, ash 0.005%, fat trace, protein (N × 6.25) trace, sucrose (polarimetric method) 97 to 98%, corn starch (starch U.S.P.) 2 to 3%.

Calories.—4 per gram; 114 per ounce.

McCAHAN'S SUNNY BRAND CANE SUGAR, EXTRA FINE GRANULATED, finely granular refined cane sugar

Analysis and Calories.—Same as for McCahan's Sunny Brand Cane Sugar, Confectioners XXXX.

McCAHAN'S SUNNY BRAND CANE SUGAR, HOSTESS TABLETS, refined cane sugar in loaf form.

Analysis and Calories.—Same as for McCahan's Sunny Brand Cane Sugar, Confectioners XXXX.

McCAHAN'S SUNNY BRAND CANE SUGAR, PARTY CUBES, refined cane sugar in cubes.

Analysis and Calories.—Same as for McCahan's Sunny Brand Cane Sugar, Confectioners XXXX.

McCAHAN'S SUNNY BRAND CANE SUGAR, POWDERED, refined cane sugar reduced to a powder.

Analysis and Calories.—Same as for McCahan's Sunny Brand Cane Sugar, Confectioners XXXX.

McCAHAN'S SUNNY BRAND CANE SUGAR, GOLDEN YELLOW, a light yellow grade of refined cane sugar.

Analysis (submitted by manufacturer).—Moisture 4.3%, total solids 95.7%, ash 0.5%, fat none, protein (N × 6.25) 0.1%, reducing sugars as invert sugar 2.5%, sucrose (polarimetric method) 92.1%, carbohydrates (by difference) 95.1%.

Calories.—3.8 per gram; 108 per ounce.

McCAHAN'S SUNNY BRAND CANE SUGAR, OLD TIME BROWN, a brown grade of refined cane sugar.

Analysis (submitted by manufacturer).— Moisture 4.7%, total solids 95.3%, ash 1.5%, fat trace, protein (N × 6.25) 0.4%, reducing sugars as invert sugar 8.2%, sucrose (polarimetric method) 84.9%, carbohydrates (by difference) 93.4%.

Calories.—3.8 per gram; 108 per ounce.

DEXTROSE

Recently chemically pure dextrose has become available in relatively large quantities. According to federal definition and standards,[3] dextrose is the product made by the hydrolysis of starch followed by processes of refining and crystallization. When derived from cornstarch (starch U. S. P.), dextrose is

2. Additional products are listed in section VI, entitled "Preparations Used in the Feeding of Infants."

3. Service and Regulatory Announcements, Food and Drug No. 2, fifth revision, United States Department of Agriculture, Food and Drug Administration, November 1936.

known commercially as refined corn sugar. Anhydrous dextrose ($C_6H_{12}O_6$) contains not less than 99.5 per cent dextrose and not more than 0.5 per cent moisture.

Because dextrose is absorbed as such and circulates unchanged in the blood stream, it has been supposed that it would be absorbed quickly and with no effort on the part of the body because it requires no enzymic process to make it suitable for absorption. Experimental evidence [4] indicates that the rate of absorption of dextrose is similar to that of many other carbohydrates of physiologic importance.

Dextrose is well utilized as a food, but it possesses no practical advantages when administered by mouth to prevent or relieve fatigue or to maintain muscular efficiency to a high degree. The evidence of any superiority, under normal conditions, of dextrose ingested as the free sugar over dextrose ingested as the polysaccharide starch is not convincing.[5]

The listed products [2] of the following firms stand accepted:

Corn Products Refining Company, New York.

KARO BRAND DEXTROSE, U. S. P.

Analysis (submitted by manufacturer) —Ash 0.096%, moisture 7.87%, optical rotation + 52.63, chlorides trace, starch absent, erythrodextrin trace.

Calories.—4 per gram; 114 per ounce.

SYRUPS

Many varieties of syrups are available to the consumer; of these the Council on Foods has accepted a number of brands. Syrups are derived from corn, sugar cane, sorghum cane and maple sap. Federal definitions and standards [3] for the various syrups are as follows:

Molasses is the product left after the sugar has been separated from massecuite, melada, mush sugar or concrete.[6] It contains not more than 25 per cent water and not more than 5 per cent ash.

Refiners' syrup is the residual liquid product obtained in the process of refining raw cane sugar. It contains not more than 25 per cent water and not more than 8 per cent ash.

Cane syrup is the syrup made by the evaporation of the juice of the sugar cane. It contains not more than 30 per cent moisture and not more than 2.5 per cent ash.

Sugar syrup is the product made by dissolving cane or beet sugar to the consistency of a syrup; it contains not more than 35 per cent water.

---

4. Mailes, W. C. D., and Scott, K. J. L.: Further Observations on the "Digestibility" of Common Foodstuffs as Determined by Radiography, Lancet 1:1300 (June 29) 1935. Cori, C. F.: The Fate of Sugar in the Animal Body; I. The Rate of Absorption of Hexoses and Pentoses from the Intestinal Tract, J. Biol. Chem. 66:691 (Dec.) 1925.

5. Dextrose: Its Place in the Diet of Normal Adults, Report of the Council on Foods, J. A. M. A. 108:556 (Feb. 13) 1937.

6. Massecuite, melada, mush sugar and concrete are products made by evaporating the purified juice of a sugar-producing plant or a solution of sugar to a solid or semisolid consistence, in which the sugar exists chiefly in a crystalline state.

Sorghum syrup is the syrup obtained by the clarification and concentration of the juice of the sugar sorghum. It contains not more than 30 per cent water and not more than 6.25 per cent ash calculated on a dry basis.

Maple syrup is the syrup made by the evaporation of maple sap or the solution of maple sugar obtained from the evaporation and crystallization of maple sap. Maple sugar is about 90 per cent sucrose and contains certain nonsugar substances which give it its characteristic flavor and color. The syrup contains not more than 35 per cent water. The finished product weighs not less than 11 pounds to the gallon.

For mixtures of maple syrup and cane syrup, there are no federal standards as regards the percentage of maple syrup in the combination. But some states have regulations setting minimum percentages of maple syrup which syrup sold in the state under labels mentioning the word "maple" must contain. As a result of this it is possible for a brand of syrup to be sold in one state with 40 per cent maple syrup in it and in another state with only 20 per cent, in both under the label "cane and maple."

In general, the white syrups that stand accepted by the Council on Foods consist of a mixture of corn syrup ingredient (glucose) and sugar syrup with added flavoring. The flavoring may be vanilla extract, imitation maple flavor or vanillin and coumarin. The dark or golden syrups consist of corn syrup (glucose) flavored with refiners' syrup. Sugar syrup also is added in a few brands.

According to federal definition,[3] glucose is a thick, syrupy, colorless product made by the hydrolysis of corn starch followed by processes of decolorization and evaporation. It contains not more than 1 per cent ash, which consists chiefly of chlorides and sulfates.

In the preparation of the brands of this type of syrup that stand accepted, the corn syrup ingredient is prepared by hydrolyzing corn starch in an acid solution under steam pressure until a definite percentage of dextrose is formed. The solution is then neutralized with sodium carbonate and filtered. The filtrate is concentrated in vacuum to a density conforming to federal standards. Corn syrup is usually mixed with a much smaller quantity of sugar syrup and flavored. The mixture is heated to 80 C. and packed in cans. This syrup is designated as white syrup. For the golden syrups, the corn syrup is mixed with a small proportion of refiners' syrup conforming to federal standards. The mixture is heated and packed in cans. The addition of refiners' syrup increases the ash content of the darker syrups. The range in composition of accepted brands of white and dark syrups is given in the accompanying table.

Molasses is a by-product of cane sugar refinery. It consists primarily of noncrystallizable sugars and other material obtained

Composition of Syrups (Submitted by Manufacturers)

Product	Moisture, %	Total Solids, %	Ash, %	Fat,* %	Protein,† %	Reducing Sugars,‡ %	Total Carbo-hydrates,§ %	Calories Gm.	Calories Oz.
Cane syrup	28.0	72.0	2.5	0.0	0.4	12.1	69.1	2.8	80
Cane and corn syrup	26.2	73.8	1.3	0.0	0.2	23.4	72.3	2.9	82
Cane sugar and maple syrup	32.1	67.9	0.2	0.0	0.1	3.5	67.6	2.7	77
Corn syrup products, dark	23.0-26.4	77.0-73.6	0.4-1.4	0.0	0.0-0.2	30.4-38.7	73.1-80.5	2.9-3.2	82-91
Corn syrup products, light	23.6-25.6	76.4-74.4	0.2-0.4	0.0	0.0-0.2	27 7-36.5	74.1-76.1	2.9-3.1	82-88
Fruit syrup	28.0	72.0	0.4	0.0	0.2	69.6	71.4	2.9	82
Maple syrup	33.2	66.8	0.7	0.0	0.0	4.2	66.1	2.6	74
Molasses, dark	22.2	77.8	3.6	0.0	0.5	25.1	73.7	3.0	85
Molasses, light	23 0	77.0	6.0	0.0	0.9	17.3	70.1	2.8	80
Sorghum	21.9	78.1	2.3	0.0	0.4	34.7	75.4	3.0	85
Sorghum-flavored corn syrup	23 5	76.5	1.7	0.0	0.8	34.6	74.5	3.0	85

* Ether extract.
† N × 6.25.
‡ As dextrose.
§ By difference.

when cane sugar is crystallized out. Types of molasses derived from successive crystallizations of sugar are designated as first, second and third molasses; they. differ from each other in sucrose and ash content, the first molasses containing more sucrose and less ash than either the second or the third. The water content of all molasses is not more than 25 per cent. Molasses and molasses products contain some sulfur dioxide. According to federal regulations,[8] molasses can contain not more than 5 per cent ash.

Sorghum syrup is obtained from sorghum cane juice. Sorghum cane is a coarse grass not so large as sugar cane. It differs from the sugar cane in that it is a hardier plant and can be grown in wider areas, requires only a short season and is grown from a seed instead of propagated from nodes from the stalks. Sorghum cane juice does not have as high a sucrose content as sugar cane juice. In the preparation of sorghum syrup, the juice is expressed from sorghum cane stalks, clarified, filtered and concentrated under vacuum to a syrup containing not more than 25 per cent water. A gallon of the finished syrup weighs about 11.25 pounds.

Fruit syrups are prepared by concentrating the juice expressed from fruit and adding sugar.

Molasses

The listed products of the following firm stand accepted:

Penick and Ford, Ltd., Incorporated, New York, products distributed by Penick and Ford, Ltd., Incorporated, New Orleans.

BRER RABBIT BRAND NEW ORLEANS MOLASSES (GOLD LABEL), pasteurized New Orleans molasses taken from the first crystallization liquor in the preparation of cane sugar and treated with sulfur dioxide.

Analysis (submitted by manufacturer).—Moisture 22.2%, total solids 77.8%, ash 3.6%, fat none, protein (N $\times$ 6.25) 0.5%, reducing sugars as invert sugar 25.1%, sucrose 43.1%, carbohydrates (by difference) 73.7%, calcium (Ca) 0.15%, iron (Fe) 5 mg. per hundred grams, sulfur dioxide (SO_2) 19.5 mg. per hundred grams.

Calories.—3.0 per gram; 85 per ounce.

BRER RABBIT BRAND NEW ORLEANS MOLASSES (GREEN LABEL), pasteurized New Orleans molasses taken from the second crystallization liquor in the preparation of cane sugar and treated with sulfur dioxide.

Analysis (submitted by manufacturer).—Moisture 23.0%, total solids 77.0%, ash 6.0%, fat none, protein (N $\times$ 6.25) 0.9%, reducing sugars as invert sugar 17.3%, sucrose 43.4%, carbohydrates (by difference) 70.1%, calcium (Ca) 0.27%, iron (Fe) 6 mg. per hundred grams, sulfur dioxide (SO_2) 5.3 mg. per hundred grams.

Calories.—2.8 per gram; 80 per ounce.

Cane Syrup

The listed products of the following firm stands accepted:

Penick and Ford, Ltd., Incorporated, New York, products distributed by Penick and Ford, Ltd., Incorporated, New Orleans.

BRER RABBIT BRAND SUGAR CANE SYRUP (BLUE LABEL), pasteurized cane syrup prepared by evaporation of sugar cane juice, treated with sulfur dioxide (SO_2).

Analysis (submitted by manufacturer).—Moisture 28.0%, ash 2.5%, fat (ether extract) 0.0%, protein (N × 6.25) 0.4%, reducing sugars as invert sugar 12.1%, reducing sugars after inversion (as invert sugar) 68.4%, sucrose (copper reduction method) 53.5%, carbohydrates (by difference) 69.1%, iron (Fe) 0.0007%, calcium (Ca) 0.09%, sulfur dioxide (SO_2) 12 mg. per kilogram.

Calories.—2.8 per gram; 80 per ounce.

BRER RABBIT BRAND SUGAR CANE AND CORN SYRUP (BROWN LABEL), a pasteurized mixture of cane syrup and corn syrup, treated with sulfur dioxide (SO_2).

Analysis (submitted by manufacturer).—Moisture 26.2%, ash 1.3%, fat (ether extract) 0.0%, protein (N × 6.25) 0.2%, reducing sugars as invert sugar 23.4%, reducing sugars after inversion (as invert sugar) 54.1%, sucrose (copper reduction method) 29.2%, dextrins (by calculation) 18.2%, carbohydrates (by difference) 72.3%, iron (Fe) 0.0005%, calcium (Ca) 0.05%, sulfur dioxide 11 mg. per kilogram.

Calories.—2.9 per gram; 82 per ounce.

Sorghum Syrup

The listed product of the following firm stands accepted:

American Syrup and Sorghum Company, St. Louis.

FARMER JONES BRAND COUNTRY SORGHUM SYRUP, concentrated clarified sorghum cane juice.

Analysis (submitted by manufacturer).—Moisture 21.9%, total solids 78.1%, ash 2.3%, fat none, protein (N × 6.25) 0.4%, reducing sugars as invert sugar 34.7%, sucrose 36.4%, dextrins (by difference) 4.3%, carbohydrates (by difference) 72.3%.

Calories.—3.0 per gram; 85 per ounce.

Sorghum-Flavored Corn Syrup

The listed product of the following firm stands accepted:

Union Sales Corporation, Columbus, Ind.

PENNANT BRAND SORGHUM FLAVORED SYRUP, corn syrup flavored with sorghum syrup.

Analysis (submitted by manufacturer).—Moisture 23.5%, total solids 76.5%, ash 1.7%, fat none, protein (N × 6.25) 0.3%, reducing sugars as dextrose 34.6%, sucrose (by inversion) 8.4%, carbohydrates (by difference) 74.5%, titratable acidity as HCl 0.1%, sulfur dioxide (SO_2) 0.002%, p_H 5.8.

Calories.—3.0 per gram; 85 per ounce.

Maple Syrup

The listed product of the following firm stands accepted:

Cary Maple Sugar Company, Inc., St. Johnsbury, Vt.

HIGHLAND BRAND 100% VERMONT MAPLE SAP SYRUP, pasteurized Vermont maple syrup prepared by evaporating and filtering maple sap.

Analysis (submitted by manufacturer).—Moisture 33.2%, total solids 66.8%, ash 0.7%, fat none, protein (N × 6.25) none, reducing sugars as invert sugar 4.2%, sucrose (by inversion) 60.0%, carbohydrates (by difference) 66.1%, lead number (Canadian[7]) 4.4, lead number (Winton[7]) 1.6, conductivity (25 Gm. solids) 138, malic acid value 0.70.

Calories.—2.6 per gram; 74 per ounce.

---

7. Official and Tentative Methods of Analysis of the Association of Official Agricultural Chemists, ed. 3, Washington, D. C., Association of Official Agricultural Chemists, 1930, pp. 302-303.

Sugar and Maple Syrup

The listed product of the following firm stands accepted:

Steuart, Son and Company, Inc., Baltimore.

STEUART'S GOLDEN CROWN BRAND CANE SUGAR AND MAPLE SYRUP, a mixture of cane sugar syrup and maple syrup.

Analysis (submitted by manufacturer).—Moisture 32.1%, total solids 67.9%, ash 0.2%, protein (N × 6.25) 0.1%, reducing sugars as invert sugar 3.5%, sucrose (estimated from reducing sugars before and after inversion) 63.0%, carbohydrates (by difference) 67.6%, lead number (Canadian [7]) 0.96, lead number (Winton [7]) 0.49, malic acid number 0.10.

Calories.—2.7 per gram; 77 per ounce.

Fruit Syrup

The listed product of the following firm stands accepted:

Ridgewood Orchards, Inc., Winchester, Va.

SHENANDOAH BRAND APPLE SYRUP, a syrup made from concentrated apple juice and cane sugar.

Analysis (submitted by manufacturer).—Moisture 28.0%, total solids 72.0%, ash 0.4%, fat none, protein (N × 6.25) 0.2%, reducing sugars as invert sugar 69.6%, carbohydrates (by difference) 71.4%.

Calories.—2.9 per gram; 82 per ounce.

Corn Syrup Products

The listed products [2] of the following firms stand accepted:

The American Maize-Products Company, New York.

AMAIZO BRAND CRYSTAL WHITE SYRUP.
AMAIZO BRAND GOLDEN SYRUP.
JAK 'N JIL BRAND CRYSTAL WHITE SYRUP.
JAK 'N JIL BRAND GOLDEN SYRUP.

American Syrup & Preserving Company, Nashville, Tenn.

AMERICAN TABLE BRAND GOLDEN SYRUP.

American Syrup & Sorgum Company, St. Louis.

AMERICAN BRAND GOLDEN SYRUP.
CRYSTAL FLAKE BRAND CRYSTAL WHITE SYRUP.

Atlantic Syrup Refining Co., Philadelphia.

QUAKER MAID BRAND GOLDEN SYRUP.

Bliss Syrup & Preserving Co., Kansas City, Mo.

BLISS BRAND CRYSTAL WHITE SYRUP.
BLISS BRAND GOLDEN SYRUP.
BLISS PANCAKE BRAND CRYSTAL WHITE SYRUP.
BLISS PANCAKE BRAND GOLDEN SYRUP.
NECTAR BRAND GOLDEN SYRUP.
PALLAS BRAND CRYSTAL WHITE SYRUP.

Colonial Molasses Company, Incorporated, Brooklyn.

KENT BRAND GOLDEN SYRUP.

Corn Products Refining Company, New York.

KARO BRAND CRYSTAL WHITE SYRUP, vanilla flavor.
KARO BRAND CRYSTAL WHITE SYRUP, imitation maple flavor.
KARO BRAND GOLDEN SYRUP.
KARO BRAND POWDERED CRYSTAL WHITE SYRUP.[2]
REX BRAND CRYSTAL WHITE SYRUP.
REX BRAND GOLDEN SYRUP.

Foley Bros. Grocery Company, St. Paul. *See* Griggs, Cooper & Co., St. Paul.

Griggs, Cooper & Company, St. Paul.
HOME BRAND CRYSTAL WHITE SYRUP.
HOME BRAND GOLDEN SYRUP.

Products distributed by Foley Bros. Grocery Company, St. Paul.
FOLEY'S BRAND AMBER SYRUP.
FOLEY'S BRAND CRYSTAL WHITE SYRUP.

The Hubinger Company, Keokuk, Iowa.
GOLD-N-SWEET BRAND GOLDEN SYRUP.
SILVER-SWEET BRAND CRYSTAL WHITE SYRUP.

Jack Sprat Foods, Inc., Marshalltown, Iowa. *See* Western Grocer Company, Marshalltown, Iowa.

Mangels, Herold Co., Incorporated, Baltimore.
KING BRAND GOLDEN SYRUP.

Marshall Canning Company, Marshalltown, Iowa. *See* Western Grocer Company, Marshalltown, Iowa.

Oelerich & Berry Company, Chicago.
GOLDEN GRAIN BRAND AMBER SYRUP.
GOLDEN-GRAIN BRAND CRYSTAL WHITE SYRUP.

Penick & Ford, Ltd., Inc., New York, products distributed by Penick & Ford, Ltd., Inc., Cedar Rapids, Iowa.
PENFORD BRAND CRYSTAL WHITE SYRUP
PENFORD BRAND GOLDEN SYRUP.
PENICK BRAND CRYSTAL WHITE SYRUP.
PENICK BRAND GOLDEN SYRUP.

The Pioneer Maple Products Company, Incorporated, St. Paul.
BONNIE BRAND GOLDEN SYRUP.

Scientific Sugars Company, Columbus, Ind.
CARTOSE.[2]

D. B. Scully Syrup Company, Chicago.
BANNER BLUE BRAND CORN SYRUP WITH CANE FLAVOR.
SILVER TIP BRAND GOLDEN PANCAKE SYRUP.
SWEETHEART BRAND GOLDEN PANCAKE SYRUP.
WHITE BRAND CRYSTAL SYRUP.

A. E. Staley Manufacturing Company, Decatur, Ill.
STALEY'S BRAND CRYSTAL WHITE SYRUP.
STALEY'S BRAND GOLDEN SYRUP.

Steuart, Son & Company, Inc., Baltimore.
GOLDEN CROWN BRAND WHITE SYRUP.
GOLDEN CROWN BRAND GOLDEN SYRUP.

J. Stromeyer Co., Philadelphia.
TURKEY BRAND GOLDEN SYRUP.

The Torbitt & Castleman Company, Louisville, Ky.
BOB WHITE BRAND CRYSTAL WHITE SYRUP.
BOB WHITE BRAND GOLDEN SYRUP.

Union Starch & Refining Company, Columbus, Ind., products distributed by Union Sales Corporation, Columbus, Ind.
PENNANT BRAND CRYSTAL WHITE SYRUP.
PENNANT BRAND GOLDEN SYRUP.
UNION BRAND CRYSTAL WHITE SYRUP.
UNION BRAND GOLDEN SYRUP.

Western Grocer Company, Marshalltown, Iowa, products distributed by Jack Sprat Foods, Inc., Marshalltown, Iowa.
JACK SPRAT BRAND CRYSTAL WHITE SYRUP.
JACK SPRAT BRAND GOLDEN SYRUP.

Products distributed by Marshall Canning Company, Marshalltown, Iowa.
FAULTLESS BRAND CRYSTAL WHITE SYRUP.
FAULTLESS BRAND GOLDEN SYRUP.
MARSHALL BRAND CRYSTAL WHITE SYRUP.
MARSHALL BRAND GOLDEN SYRUP
UNCLE WILLIAM BRAND CRYSTAL WHITE SYRUP.
UNCLE WILLIAM BRAND GOLDEN SYRUP.

Wheeler-Barnes Company, Minneapolis.
GOLDEN OAK BRAND AMBER SYRUP.
WHITE OAK BRAND CRYSTAL WHITE SYRUP.

The following firms distribute under their own labels syrups purchased from manufacturers of accepted products now privileged to use the Seal of Acceptance. The labels and advertising conform to the Rules and Decisions of the Council.

L. Allen & Sons, O'Fallon, Ill.
STOP AND SHOP BRAND GOLDEN SYRUP.

Alpena Wholesale Grocer Company, Alpena, Mich.
CHERRY BLOSSOM BRAND CRYSTAL WHITE SYRUP.
CHERRY BLOSSOM BRAND GOLDEN SYRUP.

Atkinson Grocery Company, Vandalia, Ill.
ATKINSON'S BRAND GOLDEN SYRUP.
ATKINSON'S BRAND WHITE SYRUP.

Beaver Dam Wholesale Company, Beaver Dam, Wis.
BEAVER BRAND CRYSTAL WHITE SYRUP.
BEAVER BRAND GOLDEN SYRUP.

Bismarck Grocery Company, Bismarck, N. D.
MINNEOPA BRAND AMBER SYRUP.
MINNEOPA BRAND CRYSTAL SYRUP.

B. E. Bridges Co., Goodland, Kan.
BEST EVER BRAND CRYSTAL WHITE SYRUP.
BEST EVER BRAND GOLDEN SYRUP.

F. C. Brown & Company, Chicago.
F. C. B. BRAND GOLDEN SYRUP.

J. A. Byerly Co., Inc., Owosso, Mich.
BYERLY'S BRAND CRYSTAL WHITE SYRUP.
BYERLY'S BRAND GOLDEN SYRUP.

The C. Callahan Company, La Fayette, Ind.
MONEY BACK BRAND GOLDEN SYRUP.
RED PLUME BRAND CRYSTAL WHITE SYRUP.

Carder Wholesale Grocery Company, St. Joseph, Mo. *See* Kansas City Wholesale Grocers Company, Kansas City, Mo.

I. Cohen Grocer Co., St. Louis.
ELCO BRAND CRYSTAL WHITE SYRUP.
ELCO BRAND GOLDEN SYRUP.

Cushing Company, Hastings, Neb.
BETTY ANN BRAND CRYSTAL WHITE SYRUP.
BETTY ANN BRAND GOLDEN SYRUP.

J. S. Dillon and Sons Stores Company, Inc., Hutchinson, Newton, Winfield, Great Bend, Dodge City and Larned, Kan.
DILLON'S RED LABEL BRAND CRYSTAL WHITE SYRUP.

The Dolan Mercantile Company, Atchison, Kan., and St. Joseph, Mo.
GYPSY BOY BRAND CRYSTAL WHITE SYRUP.
GYPSY BOY BRAND GOLDEN SYRUP.

Domanik Wholesale Grocery Company, Racine, Wis.
MARY'S BRAND GOLDEN SYRUP.

Durand-McNeil-Horner Company, Chicago.
GOLDEN BRAND CORN SYRUP WITH CANE FLAVOR.

Elliott Grocery Company, Logansport, Ind.
INDEX BRAND CRYSTAL WHITE SYRUP.
INDEX BRAND GOLDEN SYRUP.

Empire Distributing Co., St. Louis.
GOLDEN DRIP BRAND GOLDEN SYRUP.
SILVER DRIP BRAND CRYSTAL WHITE SYRUP.

Federal Wholesale Corporation, Eldorado, Ill.
OZARK BRAND CRYSTAL WHITE SYRUP.
OZARK BRAND GOLDEN SYRUP.

The E. H. Frechtling Company, Hamilton, Ohio.
FORT HAMILTON BRAND CRYSTAL WHITE SYRUP.
FORT HAMILTON BRAND GOLDEN SYRUP.

Gildehaus, Wulfing & Co., St. Louis.
PRESIDENT BRAND CRYSTAL WHITE SYRUP.
UNCLE SAM BRAND GOLDEN SYRUP.

Glick Mercantile Co., Pittsburg, Kan.
GLICK BRAND CRYSTAL WHITE SYRUP.
GLICK BRAND GOLDEN SYRUP.

Grand Traverse Grocery Company, Traverse City, Mich.
CHERRY BLOSSOM BRAND CRYSTAL WHITE SYRUP.
CHERRY BLOSSOM BRAND GOLDEN SYRUP.

Grocers' Wholesale Company, Des Moines, Iowa.
G. W. C. BRAND AMBER SYRUP.
G. W. C. BRAND CRYSTAL WHITE SYRUP.

The Guymon-Petre Mercantile Co., Dodge City and Hutchinson, Kan.
HIGH UP BRAND CRYSTAL WHITE SYRUP.
HIGH UP BRAND GOLDEN SYRUP.

Harrison Grocery Company, Harrison and Cotter, Ark., and Monett, Mo.
GOLD BOND BRAND CORN SYRUP WITH CANE FLAVOR.

Hassendeubel Grocery Company, St. Louis.
CEDAR HILL BRAND WHITE SYRUP.
CEDAR HILL BRAND GOLDEN SYRUP.

Heiman Grocery Co., Trenton, Mo.
HEIMAN'S BRAND CRYSTAL WHITE SYRUP.
HEIMAN'S BRAND GOLDEN SYRUP.

Hooper Grocery Company, Nashville, Tenn.
CLOVER BLOSSOM BRAND GOLDEN SYRUP.

Independent Grocers' Alliance Distributing Co., Chicago.
I. G. A. BRAND CRYSTAL WHITE SYRUP.
I. G. A. BRAND GOLDEN SYRUP.

Products distributed by Independent Grocers' Alliance Distributors, Inc., New York.
I. G. A. BRAND CRYSTAL WHITE SYRUP.
I. G. A. BRAND GOLDEN SYRUP.

Independent Grocers' Alliance Distributors, Inc., New York. *See* Independent Grocers' Alliance Distributing Co., Chicago.

Jett & Wood Central Mercantile Co., Hutchinson and Liberal, Kan. *See* the Jett & Wood Mercantile Co., Wichita, Kan. and Lamar, Colo.

Jett & Wood Mercantile Co., Wichita, Kan., and Lamar, Colo.
HARVEST HOME BRAND CRYSTAL WHITE SYRUP.
HARVEST HOME BRAND GOLDEN SYRUP.

Products distributed by Jett & Wood Central Mercantile Co., Hutchinson and Liberal, Kan.
HARVEST HOME BRAND CRYSTAL WHITE SYRUP.
HARVEST HOME BRAND GOLDEN SYRUP.

Joannes Brothers Company, Green Bay, Wis.
JOANNES BRAND CRYSTAL WHITE SYRUP.
JOANNES BRAND GOLDEN SYRUP.

Kansas City Wholesale Grocers Company, Kansas City, Mo.
CONGRESS BRAND CRYSTAL WHITE SYRUP.
CONGRESS BRAND GOLDEN SYRUP.
HEART OF AMERICA BRAND CRYSTAL WHITE SYRUP.
HEART OF AMERICA BRAND GOLDEN SYRUP.

Products distributed by Carder Wholesale Grocery Company, St. Joseph, Mo.
JO-MO BRAND CRYSTAL WHITE SYRUP.
JO-MO BRAND GOLDEN SYRUP.

Henry Kraft Mercantile Company, Nevada, Mo.
KRAFT'S RED RIBBON BRAND CRYSTAL WHITE SYRUP.
KRAFT'S BLUE RIBBON BRAND GOLDEN SYRUP.

Andrew Kuehn Company, Sioux Falls, S. D.
ANDREW KUEHN COMPANY'S K-K BRAND AMBER SYRUP.
ANDREW KUEHN COMPANY'S K-K BRAND CRYSTAL SYRUP.

Lafer Brothers, Detroit.
LAFER BROS. BRAND GOLDEN SYRUP.

H. P. Lau Co., Lincoln and Fremont, Neb.
BLACK BIRD BRAND AMBER SYRUP.
BLACK BIRD BRAND CRYSTAL WHITE SYRUP.

The H. D. Lee Mercantile Co., Kansas City, Mo.
H. G. F. STORES BRAND GOLDEN SYRUP.
SUMMER GIRL BRAND GOLDEN SYRUP.

H. A. Marr Grocery Co., Denver.
BRIMFULL BRAND AMBER SYRUP.
BRIMFULL BRAND CRYSTAL WHITE SYRUP.

Maryland Grocery Company, Baltimore.
LUCKY BRAND GOLDEN SYRUP.

L. C. Mercantile Company, Inc., Mendota, Quincy, Springfield and Danville, Ill., and Fort Wayne, Ind.
L. C. BRAND CRYSTAL WHITE SYRUP.
L. C. BRAND GOLDEN SYRUP.

Meyer Schmid Grocer Company, St. Louis.
OUR PRIDE BRAND CRYSTAL WHITE SYRUP.
OUR PRIDE BRAND GOLDEN SYRUP.

Milburn-Johnston Grocery Company, Kensett, Shirley and Searcy, Ark.
GOLD BOND BRAND WHITE SYRUP.
GOLD BOND BRAND CORN SYRUP WITH CANE FLAVOR.

National Retailer-Owned Grocers, Inc., Chicago.
SHURFINE BRAND WHITE SYRUP.
SHURFINE BRAND GOLDEN SYRUP.

New York Store Mercantile Co., Cairo, Ill.
CANEW BRAND GOLDEN SYRUP.
CONSOLATION BRAND WHITE SYRUP.

The Oklahoma-Kansas Wholesale Grocery Co., Arkansas City, Kan.
CHILOCCO BRAND WHITE SYRUP.
CHILOCCO BRAND CORN SYRUP WITH CANE FLAVOR.

L. Patterson Mercantile Company, Mankato, Minn.
MINNEOPA BRAND CRYSTAL WHITE SYRUP.
MINNEOPA BRAND GOLDEN SYRUP.

Paxton and Gallagher Company, Omaha.
KAMO BRAND AMBER SYRUP.
WHITE SWAN BRAND CRYSTAL SYRUP.

L. Pearlstone, St. Louis.
PEARL BRAND CRYSTAL WHITE SYRUP.
FLOWING GOLD BRAND GOLDEN SYRUP

A. H. Perfect & Co., Fort Wayne, Richmond and Huntington, Ind.; Xenia, Ohio, and Sturgis, Mich.
PERFECT'S BRAND CRYSTAL WHITE SYRUP.
PERFECT'S BRAND GOLDEN SYRUP.

Plumb & Nelson Co., Manitowoc, Wis.
MANOWIS BRAND CORN SYRUP WITH CANE FLAVOR.
WHITE HOUSE BRAND CRYSTAL WHITE SYRUP.

Pocahontas Grocery Company, Pocahontas, Ark.
OZARK BEAUTY BRAND WHITE SYRUP.
OZARK BEAUTY BRAND GOLDEN CORN SYRUP WITH CANE FLAVOR.

Portage Wholesale Co., Portage, Wis.
PORTAGE BRAND CRYSTAL WHITE SYRUP.
PORTAGE BRAND GOLDEN SYRUP.
AUNT SALLY BRAND CRYSTAL WHITE SYRUP.
AUNT SALLY BRAND GOLDEN SYRUP.

Puckett's Cash Stores, Sayre, Okla.
PUCKETT'S BRAND GOLDEN CORN SYRUP WITH CANE FLAVOR.
PUCKETT'S BRAND GOLDEN SYRUP.
PUCKETT'S BRAND CRYSTAL WHITE SYRUP.

The Ranney-Davis Mercantile Company, Arkansas City and Wichita, Kan.
SANTA FE BRAND CRYSTAL WHITE SYRUP.
SANTA FE BRAND GOLDEN SYRUP.

Red & White Corporation, Chicago.
BLUE AND WHITE BRAND CRYSTAL WHITE SYRUP.
BLUE AND WHITE BRAND GOLDEN SYRUP.

Sault Wholesale Grocers, Sault Ste. Marie, Mich.
CHERRY BLOSSOM BRAND CRYSTAL WHITE SYRUP.
CHERRY BLOSSOM BRAND GOLDEN SYRUP.

W. M. Shafor & Company, Frankfort, Ind.
SHAFOR BRAND CRYSTAL WHITE SYRUP.
SHAFOR BRAND GOLDEN SYRUP.

Frank C. Schilling Co., Green Bay, Wis.
SCHILLING'S NICOLET BRAND CRYSTAL WHITE SYRUP.
SCHILLING'S NICOLET BRAND GOLDEN SYRUP.

Schnull & Company, Indianapolis.
DIADEM BRAND GOLDEN SYRUP.
DIADEM BRAND WHITE SYRUP.

Sentney Wholesale Grocery Co., Hutchinson, Kan.
FAUST BRAND CRYSTAL WHITE SYRUP.
FAUST BRAND GOLDEN SYRUP.

Sherman Brothers, Sioux City, Iowa.
OLD SETTLER BRAND CRYSTAL WHITE SYRUP.
OLD SETTLER BRAND GOLDEN SYRUP.

Springfield Grocer Company, Springfield, Mo.
YELLOW BONNET BRAND CRYSTAL WHITE SYRUP.
YELLOW BONNET BRAND GOLDEN SYRUP.

A. E. Staley Manufacturing Company, Decatur, Ill.
BROTHERS PRIDE BRAND CRYSTAL WHITE SYRUP
BROTHERS PRIDE BRAND GOLDEN SYRUP.

Standard Grocery Company, Indianapolis.
JACKSON'S BRAND GOLDEN SYRUP.

Temple Stephens Company, Moberly, Mo.
TEMPLE STEPHENS BRAND CRYSTAL WHITE SYRUP.
TEMPLE STEPHENS BRAND GOLDEN SYRUP.

Tolerton & Warfield Co., Sioux City, Iowa.
GOLDEN RULE BRAND AMBER SYRUP.
GOLDEN RULE BRAND WHITE SYRUP.
SUPERB BRAND AMBER SYRUP.
SUPERB BRAND WHITE SYRUP.

Tom-Boy Stores, Inc., St. Louis.
TOM-BOY BRAND CRYSTAL WHITE SYRUP.
TOM-BOY BRAND GOLDEN SYRUP.

Twin City Wholesale Grocer Company, St. Paul and Minneapolis and Fargo, N. D.
FAIRWAY BRAND GOLDEN SYRUP.
FAIRWAY BRAND WHITE SYRUP.

Twin Ports Wholesale Grocer Co., Duluth, Minn., and Superior, Wis.
FAIRWAY BRAND GOLDEN SYRUP.
FAIRWAY BRAND WHITE SYRUP.

Union Sales Corporation, Columbus, Ind.
GOLDEN DRIP BRAND GOLDEN SYRUP.
PLATO BRAND CRYSTAL WHITE SYRUP.
PLATO BRAND GOLDEN SYRUP.
SILVER DRIP BRAND CRYSTAL WHITE SYRUP.

United Buyers Corporation, Chicago.
DEERWOOD BRAND GOLDEN SYRUP.
DEERWOOD BRAND WHITE SYRUP.
U BE SEE BRAND GOLDEN SYRUP.
U BE SEE BRAND WHITE SYRUP.

The Watson Wholesale Grocery Co., Salina, Kan.
U BE SEE BRAND CRYSTAL WHITE SYRUP.
U BE SEE BRAND GOLDEN SYRUP.

G. H. Wetterau & Sons Grocer Co., St. Louis, Desloge and Mexico, Mo., and Marion, Ill.
LIBERTY BRAND CRYSTAL WHITE SYRUP.
LIBERTY BRAND GOLDEN SYRUP.

White Villa Grocers, Inc., Cincinnati and Dayton, Ohio.
HONEY GROVE BRAND CRYSTAL WHITE SYRUP
HONEY GROVE BRAND GOLDEN SYRUP.

Wilson Mercantile Company, Wausau and Rhinelander, Wis.
VALLEY QUEEN BRAND AMBER SYRUP.
VALLEY QUEEN BRAND CRYSTAL SYRUP.

Winston and Newell Company, Minneapolis.
ANGEL FOOD BRAND GOLDEN SYRUP.
ANGEL FOOD BRAND WHITE SYRUP.

Wood County Grocery Co., Inc., Wisconsin Rapids, Wis.
FAIRWAY BRAND GOLDEN SYRUP.
FAIRWAY BRAND WHITE SYRUP.

Woodward Wholesale Grocery Co., Woodward, Okla.
BLUE RIBBON BRAND GOLDEN CORN SYRUP WITH CANE FLAVOR.
RED RIBBON BRAND CRYSTAL WHITE SYRUP.

Wulfing Grocer Co., St. Louis.
HAPPY HOME BRAND CRYSTAI WHITE SYRUP.
RED W BRAND GOLDEN SYRUP.

SECTION XI

Vegetables and Mushrooms

VEGETABLES

A practical definition of vegetables is not easily formulated. Certain foods which are actually fruits in the botanic sense such as tomatoes, pumpkins, peppers and okra are commonly considered as vegetables; others such as fruits of the grass family, corn, rice and barley, for example, are classed as cereals, and fruits and seeds of the legume family, such as peas, beans and lentils, are classed as vegetables. Fortunately every one has a conception of vegetables, and a definition need not be attempted here.

As a class these foods are important in the diet of man because of their nutritional value and their wide variety of flavors. The number of vegetables from which to choose is large, and owing to the endless variety of their flavors and colors these foods are justly held in high regard. From the nutritive point of view, vegetables are chiefly of value because of the vitamin C and minerals they provide. With few exceptions vitamin C is found only in plant foods; some fruits are better sources of this vitamin than any vegetables, but certain vegetables like cabbage, green peppers, potatoes and tomatoes are rated as important sources of this vitamin because of the quantity eaten. Many vegetables also contribute indigestible carbohydrates, which are helpful in the maintenance of normal laxation. Some vegetables are outstanding sources of pro-vitamin A.

Preparation of Vegetables for Eating.—The preparation of vegetables for the table in a wide variety of appetizing styles should be strongly encouraged. Some vegetables such as cabbage, lettuce, tomatoes, onions and carrots may be served uncooked as a salad or relish whereby the mineral and vitamin values are fully conserved. Vegetables are cooked by boiling in water, baking or steaming, and some, such as egg plant, may be "sautéd," or fried, in a small amount of fat.

Most vegetables are cooked before eating and the effect of cooking on the nutritive value of the raw products is of practical importance. It is generally conceded that a considerable amount of the heat labile vitamins is destroyed by prolonged heating, particularly when the food is in contact with air. It is commonly thought that the cooking of vegetables in large quantities of water, with subsequent discarding of the water, results in a large loss of water-soluble vitamins and minerals, and there is considerable evidence in support of this view.

Fenton and co-workers[1] have shown that over half of the vitamin C content of green beans, Swiss chard, carrots and peas is transferred from the vegetable to the cooking water. The highest rate of transference of vitamin C occurs during the first two minutes of cooking.

Similar findings as regards the vitamin B_1 content of vegetables have been reported. Roscoe[2] reported that in cooking water cress, lettuce, spinach and cabbage by the "domestic process" about half of the vitamin B_1 and G content is lost in the cooking water. Losses of vitamin B_1 and C are often large, even when no cooking water is discarded.

Considerable work has been done on the mineral losses sustained when vegetables are cooked. A review of recent literature[3] on this subject shows that, in general, the minerals most affected by cooking are calcium, iron, phosphorus and magnesium. The rate of leaching of these elements from the vegetable to the cooking water seems to be dependent not only on the particular element but on the amount of water coming in contact with and passing through the vegetable. For this reason, steaming or cooking vegetables in extremely small amounts of water is highly important.

On the other hand, there is much evidence that the cooking of vegetables in large volumes of water, under specified conditions, is not deleterious.[4] McCance and co-workers and Halliday and Noble[4a] report that the mineral losses incurred on boiling vegetables in hard water are not of great dietetic significance. Some vegetables may even show a gain in calcium when cooked in hard water to which some sodium chloride has been added.

Many persons consider that the best method of cooking from a nutritional point of view is to use one of the newer types of pressure cookers with as little water as possible. However,

1. Fenton, F.; Tressler, D. K., and King, C. G.: Losses of Vitamin C During the Cooking of Peas, J. Nutrition **12**: 285 (Sept.) 1936. Fenton, F.; Tressler, D. K.; Camp, S. C., and King, C. G.: Losses of Vitamin C During the Cooking of Swiss Chard, ibid. **14**: 631 (Dec.) 1937. Fenton, F., and Tressler, D. K.: Losses of Vitamin C During the Cooking of Certain Vegetables, J. Home Econ. **30**: 717 (Dec.) 1938.

2. Roscoe, H. M.: The Distribution of the Vitamin B Complex: I. Leafy Vegetables, Biochem. J. **24**: 1754, 1930.

3. Peterson, W. H., and Hoppert, C. A.: The Loss of Mineral and Other Constituents from Vegetables by Various Methods of Cooking, J. Home Econ. **17**: 265, 1925. Flanley, M. G., and Johnson, E. M.: Iron Loss in Cooking Broccoli, ibid. **24**: 821, 1932. Fisher, G.: Changes in the Content and Proportions of Mineral Substances in Vegetables with Special Reference to Iodine, Biedermann's Zentralbl. f. Agrikulturchemie **4**: 484, 1934. Talenti, M., and Ragno, A.: Studies on Vegetables: I, Ann. di chim. applicata **26**: 115, 1936. Fyler, H. M., and Manchesian, J. T.: Effect of Storage on Leaching of Minerals and Nitrogen from Asparagus and Peas During Cooking, Hilgardia **11**: 295 (June) 1938.

4. Halliday, E. G., and Noble, I. T.: Hows and Whys of Cooking, rev. ed., Chicago, University of Chicago Press, 1933.

4a. McCance, R. A., Widdowson, E. M., and Shackleton, L. R. B.: The Nutritive Value of Fruits, Vegetables and Nuts, Medical Research Council, Special Report Series, No. 213, London, His Majesty's Stationery Office, 1936. Halliday, E. G., and Noble, I. T.: Influence of Calcium in Cooking Water upon Mineral Content of Vegetables, Food Research **2**: 499, 1937. Halliday, E. G., and Noble, I. T.: The Calcium and Phosphorus Contents of Vegetables, J. Home Econ. **29**: 637, 1937.

the subject is complex and requires a comprehensive study and the collection of considerably more data than are now available. With the development of chemical methods for determining some of the vitamins, it should now be possible for investigators to formulate exact cooking instructions for the preparation of different types of vegetables so that their nutritional values may be retained to the maximum degree.

Preservation of Vegetables.—From time immemorial man has attempted to preserve foods so that he can maintain existence when green stuff is not growing. Dehydration and the admixture of a preservative such as salt, spices or vinegar with the food to be preserved are the earliest methods of food preservation. These methods are still in use today, and in addition there are the comparatively new methods of canning and quick freezing.

The canning of foods is a major industry in the United States. Over three hundred kinds of food are now canned in some three thousand canneries. Almost a can of food a day for each person is consumed in this country. At present no other method of food preservation is carried on in such a gigantic scale as canning, although in recent years the quick freeze method has made rapid progress.

The canning industry of today is the outgrowth of Nicolas Appert's experiments on preserving food by heat in hermetically sealed containers. Appert published the first description of his experiments, "L'Art De Conserver, Pendant Plusieurs Années, Toutes Les Substances Animales et Végétales," in June 1810. This had a second edition in 1811, a third in 1813 and a fourth in 1831; these were revised and augmented by Appert, the last when he was 81 years old; a fifth edition, published in 1842, after his death, was revised by his nephew Prieur Appert M. Gannal.

In the preface of his third edition[5] Appert stated: ". . . the conservation of food has always been of great interest, but until my time only two methods were used; these were desiccation and the mixture of some substance that would impede fermentation with the substance to be preserved." Appert objected to the first method, because it took away the odor, changed the taste of the juices and hardened the fiber. He had specific objections to the second method: "Sugar concealed or in part destroyed other flavors and was besides costly; salt imparted an unpleasant acerbity to substances, hardened the fiber and rendered it indigestible; vinegar could be used to a limited extent for only a few articles."

According to Appert the principle of his method of food preservation was that ". . . heat has the peculiar property, not only of changing the combination of all the constituent parts of all food substance, but also that of inhibiting for many years,

5. Appert, C.: Le livre de tous les ménages ou l'art de conserver, pendant plusieurs années, toutes les substances animales et végétales, ed. 3, Paris, Chese Barrois L'Aine, 1813.

if not destroying, the natural tendency of these same products to decompose; the application of heat in a proper manner to all foods after excluding air effects perfect preservation of these same products with all their natural qualities." It remained for Pasteur to show fifty years later that the success of preserving food according to Appert's method was determined by the destruction of micro-organisms.

Appert adapted Papin's marmite digestor, as it was called, for use in processing foods under pressure. Although Papin's digestor was carefully described in 1681 under the title of "A New Digestor or Engine for Softening Bones, Containing the Description of its Make and Use in Cookery, Voyages at Sea, Confectionery, Making of Drinks, Etc.," few persons understood its principle; consequently, from lack of regulation of both the fire and the resulting steam pressure, accidents usually attended its use. At the time of Appert, Papin's digestor was regarded as an apparatus to be avoided. But instead of abandoning the apparatus Appert analysed the cause of the accidents which occurred in its use, made an improved and enlarged autoclave of 400 liters and proved that the autoclave was useful in food preservation.

Although the details of modern commercial canning are greatly different from those of Appert, his four fundamental practices are still the basis of the modern canning procedures. In addition two other practices are now employed: immersing the raw food material in warm or hot water or exposing it to steam in order to soften vegetable fiber and inhibit enzymic action, and vacuum packing, whereby air is excluded from the can before it is sealed permanently.[6]

Sanitary Aspects of Canned Foods.—Heat processing under pressure remains today the most satisfactory method of sterilizing canned foods. The processing requirments of foods differ according to their active acidity, or p_H. Micro-organisms capable of causing spoilage in acid foods such as tomatoes and fruits have such low resistance to heat that they are destroyed at the boiling point of water. On the other hand, micro-organisms capable of causing spoilage in nonacid foods such as meats, poultry, fish, milk and vegetables require extreme intensity of heat treatment. These foods must be processed at a temperature of 120 C. for a given time to effect the destruction of spores of highly resistant bacteria which, if not destroyed, render the food unfit for human consumption.[7]

The most common spoilage organism of nonacid foods is Clostridium botulinum, an anaerobe, which grows in the absence of air and produces an extremely potent specific toxic. This toxin causes botulism, a form of poisoning characterized by

6. Bitting, A. W.: Appertizing or the Art of Canning. Its History and Development: San Francisco, The Trade Pressroom, 1937. American Can Company: The Canned Food Reference Manual, New York, 1939.

7. National Canners Association Research Laboratory: Processes for Nonacid Canned Foods in Metal Containers, Bull. 26-L, ed. 3, June, 1937. Safe Processes for Home Canners, editorial, J. A. M. A. **109**: 1046 (Sept. 25) 1937.

great muscular weakness due to paralysis of the motor nerve centers. Although Cl. botulinum has been found in samples of soil from all parts of the United States, it seems to be more abundant along the Pacific Coast than in the Mississippi Valley and the Great Lakes Region.

Spores of Cl. botulinum are extremely resistant to ordinary heat. Burke [8] has shown that the spores of some strains will survive processing for three hours at a temperature of 100 C. However, they can be destroyed at a temperature of 120 C. Since toxin produced by Cl. botulinum is thermolabile and actinolabile, some directions for home canning recommend that all vegetables and meats be boiled ten to fifteen minutes before they are tasted.

Spoilage in commercially canned foods has been eliminated, and no outbreaks of botulism have been attributed to foods canned in American factories since 1925. The situation for home-canned foods, however, is not so fortunate. Tanner [9] pointed out that in every outbreak of botulism during the years from 1929 to 1933 home-canned foods were used. These were such nonacid foods as corn, string beans, beets, pork, carrots, beet tops, spinach and vegetable soup mixtures.

In a study of thirteen outbreaks of botulism (comprising 67 persons, of whom 39 were seriously ill and 32 died) that occurred from 1932 to 1935 in Colorado, Montana, New Mexico, South Dakota and Nebraska, Hall [10] concluded: "There is no evidence that any foods other than home-canned vegetables were involved in any of the outbreaks described. Foods responsible for these outbreaks were home-canned cauliflower, home-canned beet tops, home-canned sweet corn, home-canned chili, and home-canned beets."

Foods may be safely canned in the home provided that all which are nonacid—this includes all animal and vegetable foods except tomatoes—are processed under steam pressure for a period sufficient to destroy all micro-organisms. Sound advice on home canning may be obtained from a bulletin of the United States Department of Agriculture.[11] Pressure cookers are now available which force the temperature beyond the ordinary boiling level to 115 or 120 C. with only 10 or 15 pounds of steam pressure. Unless the method is correct, however, the mere use of a pressure cooker does not assure a sterilized product.

Specifications and Grades for Canned Foods.—In 1926, when canned foods were included as storable commodities under the United States Warehouse Act, the development of standards for

---

8. Burke, G. S.: The Effect of Heat on the Spores of Bacillus Botulinus: Its Bearing on Home Canning Methods, J. A. M. A. **72**: 88 (Jan. 11) 1919.

9. Tanner, T. W.: Home Canning and Public Health, Am. J. Pub. Health **25**: 301 (March) 1935; Proper Processes for Home Canners. J. Am. Dietet. A. **11**: 18 (May) 1935.

10. Hall, I. C.: New Outbreaks of Botulism in Western United States, Food Research **1**: 171, 1936.

11. Stanley, L., and Stienbarger, M. C.: Home Cooking of Fruits, Vegetables and Meats, Farmer's Bulletin 1762, revised ed., United States Department of Agriculture, 1936.

canned fruits and vegetables was undertaken by the Bureau of Agricultural Economics. These are known as United States standards for grades. General descriptions of the standards have been summarized by Williams.[12]

Canned foods which fall below the standards for the various classes of food products which shall be promulgated from time to time must bear the statement "Below U. S. Standard" on the label immediately above or below the name of the product and also a subsequent explanatory statement, as may be prescribed under each applicable standard, such as "Good Food—Not High Grade" or "Low Quality but Not Illegal."[13]

Canned food is of standard fill when neither the head space (the distance from the bottom of the cover to the highest point of the product) nor the amount of water, brine, sugar solution or other packing medium is excessive. Canned foods which fail to meet these standards must carry the explanatory statement "Slack Fill" or "Slack Fill Contains Excess Added Liquid" immediately below the legend "Below U. S. Standard."

Nutritive Value of Canned Foods.—The only nutrients in fruits and vegetables that are likely to be affected by heat processing are vitamins B_1 and C.

Vitamin C is readily oxidized, to a compound which is inactive as an antiscorbutic agent, under certain conditions such as the presence of copper[14] and by an "enzyme"[15] in the food itself. Prolonged heating in the presence of air also destroys this vitamin.

Most of the brands of canned vegetables accepted by the Council on Foods are water or juice packed without added sugar or salt and are intended for special dietetic purposes. The description of the manufacturing process and lists of such products are in section IX entitled, "Foods for Special Dietetic Purposes." Canned vegetable products that are sieved, strained or chopped are designed for infant feeding and hence are described in section VI, "Preparations Used in the Feeding of Infants." The brands of canned vegetables described in the present section are slightly seasoned with salt or sugar and are intended for ordinary use.

The composition of accepted canned vegetables is given in table 1.

---

12. Williams, P. M.: Suggested Outline for Specification for Purchasing Canned Fruits and Vegetables, The Consumers' Project, United States Department of Labor, May 1938.

13. Service and Regulatory Announcements, Food and Drug No. 4, fourth revision, United States Department of Agriculture, Food and Drug Administration, September 1937.

14. Barron, E. S. G.; DeMeio, R. H., and Klemperer, F.: Studies on Biological Oxidations: V. Copper and Hemochromogens as Catalysts for the Oxidation of Ascorbic Acid; Mechanism of the Oxidation, J. Biol. Chem. **112**: 625, 1936. Mack, G. L., and Kertesz, Z. I.: Vitamin C in Vegetables: III. The Oxidation of Ascorbic Acid by Metallic Catalysts, Food Research **1**: 377, 1936.

15. Szent-Gyorgyi, A.: On the Function of Hexuronic Acid in the Respiration of the Cabbage Leaf, J. Biol. Chem. **90**: 385, 1931. Tauber, H.; Kleiner, I. S., and Mishkind, D.: Ascorbic Acid (Vitamin C) Oxidase, ibid. **110**: 211, 1935.

TABLE 1.—*Composition of Vegetables (Submitted by Manufacturers).*

Vegetable	Moisture, %	Total Solids, %	Ash,* %	Fat,† %	Protein (N × 6.25) %	Crude Fiber, %	Carbohydrates,‡ %	Calories Per Gm.	Calories Per Oz.
Corn, cream style	74.6	25.4	1.1	0.9	2.7§	0.3	20.4	1.0	28
Corn, niblets	72.0	28.0	1.0	1.4	3.4	3.5	21.6	1.1	31
Lima beans	80.7	....	1.4	0.3	4.9	1.2	11.5	0.7	20
Peas	84.9	15.1	1.1	0.4	3.7	1.2	8.7	0.5	15
Peas and carrots	88.7	11.3	1.3	0.1	2.3	1.2	6.4	0.4	11
Pimientos‖	92.3	7.7	0.4	0.7	1.0	0.5	5.1	0.3	9
Vegetable mixture¶	91.4	8.6	1.0	0.2	1.3	0.7	5.4	0.27	8

* Including sodium chloride.

† Ether extract.

‡ By difference.

§ Protein (N × 6.39).

‖ Report of chemical assay submitted by manufacturer shows that this product contains 144 mg. of ascorbic acid per hundred grams of pimiento, fresh basis.

¶ Containing carrots, potatoes, celery, peas, green beans, corn, onions, lima beans, okra and pimiento.

The listed products of the following firms stand accepted:

The Hills Brothers Company, New York.

DROMEDARY BRAND PIMIENTOS, canned pimiento pods packed in dilute salt brine.

The Larsen Company, Green Bay, Wis.

LARSEN'S BRAND VEG-ALL, a canned mixture of carrots, potatoes, celery, peas, green beans, corn, onions, lima beans, okra, pimiento, salt and water.

Minnesota Valley Canning Company, Le Sueur, Minn.

GREEN GIANT BRAND GREAT BIG TENDER PEAS, canned ungraded "fancy quality" Green Giant variety peas seasoned with sugar and salt.

DEL MAIZ BRAND CORN, cream style canned yellow corn with added sugar, salt and water.

DEL MAIZ BRAND NIBLETS, whole kernel canned yellow corn with added sugar, salt and water.

Pomona Products Company, Griffin, Ga.

SUNSHINE BRAND PIMIENTOS, canned cooked pimiento (sweet red) peppers without added water or salt.

Stokely Brothers & Co., Inc., Indianapolis.

STOKELY'S BRAND GREEN LIMA BEANS MEDIUM.

STOKELY'S BRAND GREEN LIMA BEANS TINY.

STOKELY'S BRAND PEAS AND CARROTS, canned diced fresh peas and carrots.

The following firms distribute under their own labels products purchased from manufacturers of accepted products now privileged to use the Seal of Acceptance. The labels and advertising conform to the Rules and Decisions of the Council.

Haas Brothers, San Francisco, Oakland and Fresno, Calif.

DODGE BRAND VEG ALL, a canned mixture of carrots, potatoes, celery, peas, green beans, corn, onions, lima beans, okra, pimiento, salt and water.

Hale-Halsell Co., McAlester, Okla.

HALE'S PRIDE BRAND VEG-ALL, a canned mixture of carrots, potatoes, celery, peas, green beans, corn, onions, lima beans, okra, pimiento, salt and water.

Independent Grocers Alliance Distributing Co., Chicago.

I. G. A. BRAND VEG-ALL, a canned mixture of carrots, potatoes, celery peas, green beans, corn, onions, lima beans, okra, pimiento, salt and water.

Plee-Zing, Inc., Chicago.

PLEE-ZING BRAND MIXED VEGETABLES, a canned mixture of carrots, potatoes, celery, peas, green beans, corn, onions, lima beans, okra, pimiento, salt and water.

Twin City Wholesale Grocer Company, St. Paul and Minneapolis and Fargo, N. D.

FAIRWAY WHITE LABEL BRAND MIXED VEGETABLES, a canned mixture of carrots, potatoes, celery, peas, green beans, corn, onions, lima beans, okra, pimiento, salt and water.

Twin Ports Wholesale Grocer Co., Duluth, Minn., and Superior, Wis.

FAIRWAY WHITE LABEL BRAND MIXED VEGETABLES, a canned mixture of carrots, potatoes, celery, peas, green beans, corn, onions, lima beans, okra, pimiento, salt and water.

Winston and Newell Co., Minneapolis.

18-K BRAND MIXED VEGETABLES, a canned mixture of carrots, potatoes, celery, peas, green beans, corn, onions, lima beans, okra, pimiento, salt and water.

Wood County Grocery Co., Inc., Wisconsin Rapids, Wis.

FAIRWAY WHITE LABEL BRAND MIXED VEGETABLES, a canned mixture of carrots, potatoes, celery, peas, green beans, corn, onions, lima beans, okra, pimiento, salt and water.

The Yantic Grain & Products Co., Norwich, Conn.

THAMES VALLEY BRAND DICED VEGETABLES, a canned mixture of carrots, potatoes, celery, peas, green beans, corn, onions, lima beans, okra, pimiento, salt and water.

MUSHROOMS

Mushroom is the common name for edible fleshy fungi, although strictly speaking the term includes both poisonous and nonpoisonous types. All mushrooms are parasitic or saprophytic and contain no chlorophyll. In this country the most popular variety for eating is Agaricus campestris, a gill-bearing mushroom.

The commercial cultivation of A. campestris has become an important food industry in the United States. Pennsylvania, Delaware and Michigan lead in production. Buildings specially equipped with humidity and temperature controls are used. Only spawn, or mushroom spores, grown under aseptic conditions are used for planting in beds that are set to a depth of 8 inches with top soil. The mushroom first comes through the ground as a little globular cap (pileus), but as the cap expands the delicate veil covering its lower part breaks, leaving a ring (annulus) around the stalk and exposing the pinkish gills radiating from the stalk. About three months are required to grow mushrooms.

Cultivated mushrooms are safe, and both cap and stem are good to eat. Although many varieties of wild mushrooms are edible, the temptation of gathering them for food should be resisted as it is difficult to distinguish between many of the edible and the poisonous species; a mistake may be fatal.

Composition and Nutritive Value.—The range in chemical composition of A. campestris was given by Mendel [16] as water from 88.9 to 92.2 per cent, total solid from 11.5 to 8.8 per cent, total nitrogen in dry substance from 4.7 to 5.4 per cent and ash in dry substance from 10.4 to 13.6 per cent. The percentage of nitrogen is higher in buttons than in mature mushrooms and higher in the caps than in the stalks.

The comparatively high nitrogen content of the mushroom led early writers to regard the fungus as an excellent source of protein. However, Mörner [17] found that only 66 per cent of the total nitrogen in samples of A. campestris was protein nitrogen. Of this protein nitrogen, 25 per cent was not digested in vitro by successive treatments with gastric and pancreatic extracts. Mendel [16] also showed that a relatively large amount of nitrogen in several species of mushrooms, including A. campestris, resisted digestion.

---

16. Mendel, L. B.: The Chemical Composition and Nutritive Value of Some Edible American Fungi, Am. J. Physiol. 1: 15 (March) 1899.

17. Mörner, C. H.: Beiträge zur Kenntniss des Nahrwerthe einiger enbaren Pilze, Ztschr. f. physiol. Chem. 10: 503, 1886.

Winterstein [18] showed that the cellulose preparations obtained by the usual methods from various fungi contained 5.5 per cent nitrogen and that this cellulose preparation was allied to the chitin found in animal foods.

The measurement of the digestibility of mushroom nitrogen by actual feeding trials was first reported by Saltet,[19] who concluded that a normal human being was able to digest only 69 per cent of the nitrogen in a sample of A. campestris. Recently Skinner, Peterson and Steenbock [20] found that albino rats digested 71 per cent of the nitrogen present in a sample of the same variety.

When it is remembered that the various species of mushrooms contain from 75 to 90 per cent water, the amount of protein in them appears strikingly small. The total nitrogenous constituents (the entire mushroom contains about 0.48 per cent nitrogen) could contain as a possible maximum only 3 per cent of protein. This amount of protein corresponds to that found in potatoes, fresh peas and corn. To obtain the daily requisite of 70 Gm. of protein a person would be obliged to consume several kilograms of fresh mushrooms a day. Therefore the expression "vegetable beefsteak" seems scarcely appropriate when applied to mushrooms.

Peterson and Elvehjem [21] reported that samples of A. campestris contained 3.1 mg. of iron and 1.8 mg. of copper per hundred grams, on a fresh basis.

The available data concerning the vitamin B content of mushrooms are confusing because they fail to differentiate the various components of this factor. In 1922 Orton, McCollum and Simmons [22] reported A. campestris to be a good source of "water-soluble vitamin B." More recently Baker and Wright [23] reported that mushrooms contain 50 international units of vitamin B_1 per hundred grams. Quackenbush, Peterson and Steenbock [24] reported that the mushroom A. campestris is a relatively good source of vitamins B_1 and G (riboflavin). Diets containing 10 and 5 per cent mushroom by dry weight basis supplied sufficient vitamin B_1 and G, respectively, to support satisfactory growth in albino rats. They also reported that mushroom protein is incomplete.

18. Winterstein, E.: Zur Kenntniss der in den Membranen der Pilze enthaltenen Bestandtheile: I, Ztschr. f. physiol. Chem. **19**: 521, 1894,

19. Saltet, R. H.: Ueber die Bedeutung des essbaren Schwamme als Nahrungsmettel für den Menschen, Arch. f. Hyg. **3**: 443, 1885.

20. Skinner, J. T.; Peterson, W. H., and Steenbock, H.: Nahrwert von Schimmelpilzmycel, Biochem. Ztschr. **267**: 169, 1933.

21. Peterson, W. H., and Elvehjem, C. A.: The Iron Content of Plant and Animal Foods, J. Biol. Chem. **78**: 215, 1928.

22. Orton, C. R.; McCollum, E. V., and Simmonds, N.: Observations on the Presence of the Anti Neuritic Substance, Water-Soluble B, in Chlorophyll Free Plants, J. Biol. Chem. **53**: 1 (July) 1922.

23. Baker, A. Z., and Wright, M. D.: The Vitamin B_1 Content of Foods, Biochem. J. **29**: 1802, 1935.

24. Quackenbush, F. W.; Peterson, W. H., and Steenbock, H.: A Study of the Nutritive Value of Mushrooms, J. Nutrition **10**: 625 (Dec.) 1935.

Mushrooms have little caloric value, 1 Gm. furnishing about 0.25 calory. The composition of accepted canned mushroom products is given in table 2.

The listed products of the following firms stand accepted:

Great Western Mushroom Company, Denver.

SAVERY-SAVORY BRAND MUSHROOM BUTTONS.
SAVERY-SAVORY BRAND MUSHROOM SLICES.
SAVERY-SAVORY BRAND MUSHROOM STEMS AND PIECES.

Grocery Store Products Company, New York. Products distributed by Edw. H. Jacob Mushroom Division of Grocery Products Manufacturing Corporation, West Chester, Pa.

JACOB BRAND MUSHROOM BROTH.
JACOB BRAND MUSHROOM BUTTONS, fancy.
JACOB BRAND MUSHROOM SLICED.
JACOB BRAND MUSHROOM SLICED STEMS AND PIECES.
JACOB BRAND MUSHROOM FILLETS.

TABLE 2.—*Composition of Mushrooms (Submitted by Manufacturers)*

Mushroom Product	Moisture, %	Ash,* %	Fat,† %	Protein (N × 6.25),‡ %	Crude Fiber, %	Carbohydrates,§ %	Calories Per Gm.	Calories Per Oz.
Buttons...	91.7	1.6	0.2	3.1	0.7	2.8	0.25	7
Slices......	93.4	1.5	0.2	2.6	0.7	1.6	0.19	5
Stems and pieces...	92.2	1.6	0.2	2.7	2.9	0.4	0.14	4
Broth.....	96.2	2.0	0.3	0.7	0.0	0.8	0.09	3

* Including the sodium chloride added during the canning process.
† Ether extract.
‡ Figures for protein are not necessarily accurate when the figure for nitrogen is multiplied by the conventional protein factor 6.25.
§ By difference.

Products distributed by Green Hill Brand Mushroom Farms, West Chester, Pa.

GREEN HILL BRAND MUSHROOM BUTTONS, fancy.
GREEN HILL BRAND MUSHROOM, SLICED.
GREEN HILL BRAND MUSHROOM, SLICED STEMS AND PIECES.

Products distributed by Kennett Square Mushroom Company, Inc., Kennett Square, Pa.

KENNETT BRAND MUSHROOM BROTH.
KENNETT BRAND MUSHROOM SLICED STEMS AND PIECES.
KENNETT BRAND BUTTONS, fancy.
KENNETT BRAND BUTTONS, sliced.

Michigan Mushroom Company, Niles, Mich.

DAWN FRESH BRAND MUSHROOM BUTTONS, fancy.
DAWN FRESH BRAND MUSHROOM PIECES AND STEMS.
DAWN FRESH BRAND MUSHROOM SLICED.
OUR LADY'S BRAND MUSHROOM BUTTONS, fancy.
OUR LADY'S BRAND MUSHROOM BUTTONS, first choice.
OUR LADY'S BRAND MUSHROOM BUTTONS, miniature.
OUR LADY'S BRAND MUSHROOM SLICED.
OUR LADY'S BRAND MUSHROOM SLICED STEMS AND PIECES.

Products distributed by Illinois Mushroom Co., Denver.

EXCELSA BRAND MUSHROOM SLICED.
EXCELSA BRAND MUSHROOM BUTTONS, fancy.
EXCELSA BRAND MUSHROOM PIECES AND STEMS.

SECTION XII

Unclassified and Miscellaneous Foods

The products included in this chapter are those that do not clearly fall into classifications discussed in previous sections of this book.

GELATIN

Gelatin is a protein derived from the collagen present in white fibrous tissue. It can be obtained from tendon, cartilage, bone and skin by boiling with water. This process is usually referred to as hydrolysis, although there is some evidence that the changes involved are physical rather than chemical. There are several methods in common use for the commercial preparation of gelatin. Cow skins and trimmings are usually steeped for several weeks in a solution of lime water and then washed and boiled with water. Pig skins and trimmings are subjected to a preliminary treatment with acid. Bones are treated to remove the fat and mineral constituents, and the organic residue is largely converted into gelatin by being heated with water. Fish skins are a minor source of gelatin; they require only treatment with water to alter the collagen. Regardless of the source, there is obtained by appropriate preliminary treatment an aqueous solution containing gelatin. This is filtered, the water is evaporated, and the dried product is broken up and ground.

Gelatin is graded chiefly according to physical characteristics such as viscosity and jelly strength. These properties depend largely on the source of the gelatin and the method of manufacture. The jelly strength is determined by the Bloom gelometer by the official method of the Edible Gelatin Manufacturers Research Society of America. Jelly strength is expressed by the trade as 75, 100, 125, 150, 175, 200, 225 or 250 Bloom grams. The figures represent the number of grams of load required to produce with a plunger having a diameter of ½ inch (1.27 cm.) a 4 mm. depression of the surface of a gelatin jelly of 6.66 per cent concentration that has been chilled at 10 C. for sixteen to eighteen hours. The load is applied by running shot into a receiver at the rate of 200 Gm. per five seconds. Gelatins of the various jelly strengths are designed for different purposes. For example, gelatin with a strength of 250 Gm. and a low p_H is intended for jellied meat, while gelatin with a strength of 200 Gm. and a high p_H is used chiefly for marshmallows.

The dried gelatin usually consists of 85 to 90 per cent pure protein. A typical analysis of gelatin is recorded in table 1.

The values for a powdered gelatin dessert are also listed because many persons think that the two products are almost identical[1] It may be noted that the prepared gelatin dessert powders contain only about 10 per cent gelatin. Gelatin desserts can be prepared from edible gelatin as well as from the prepared mixtures; this may be advantageous in the preparation of low carbohydrate diets because of the possibility of omitting sugar from the final product

Edible gelatin may contain traces of heavy metals which are present in the animal tissues from which the gelatin is derived In order to guard against contamination during the manufacturing process the federal Food and Drug Administration has

TABLE 1—*Typical Analyses of Gelatin and Gelatin Dessert Powder (Submitted by Manufacturers)*

	Gelatin, Percentage	Gelatin Dessert Powder, Percentage
Moisture	10 0	0 8
Ash .. .	1.2	0 2
Fat (ether extract)	0 0	0 0
Protein (N × 5 5)	86.5	11 0
Carbohydrates	0 0	86.0
Tartaric or citric acid	None	2 0
Added flavor.	None	Present
Added color .	None	Present
Calories per gram (approximate)	3 5	3.9

established certain limits of tolerance for arsenic, lead and copper in gelatin and other foods. These tolerances have been adopted also by the Council on Foods.

Gelatin as a Source of Protein in the Diet.—Many investigations over a period of years have brought out the significant fact that the nutritive value of proteins is measured largely by their digestibility and their amino acid makeup. It is interesting to note the occasional statement from prejudiced sources that because gelatin is obtained by partial hydrolysis it is partly digested to begin with and therefore is easily digested when eaten. Of course gelatin is readily digested by the proteolytic enzymes of the alimentary tract; but from the practical point of view the ready digestibility of gelatin does not confer on it any superiority over the common proteins.

The most extensive analysis of gelatin for amino acids is that reported by Dakin in 1920. His figures, which are based

1. The Nutritional Significance of Gelatin, Report of the Council on Foods, J. A. M. A. 107: 2132 (Dec. 26) 1936.

largely on the isolation of the individual amino acids, are recorded in table 2, together with additional data obtained by later investigators.[2]

It is interesting to note that the sum of the nitrogen in the form of the various amino acids plus the ammonia nitrogen reported by Dakin amounts to 91 per cent of the nitrogen of gelatin. From the standpoint of present knowledge of protein composition, this means that the amino acid makeup of gelatin is well known. The figures show that a number of amino acids have not been found in gelatin or are present in very small

TABLE 2.—*Amino Acids in Gelatin*

	Dakin	Other Investigators
Aminoacetic acid	25.5	26.5 (Bergmann and Stein)
Alanine	8.7	
Valine	0	
Leucine	7.1	
Isoleucine	0	
Serine	0.4	
Phenylalanine	1.4	
Tyrosine	0.01	0 (Looney)
Proline	9.5	17.5 (Bergmann and Stein)
Hydroxyproline	14.1	14.4 (Bergmann and Stein)
Aspartic acid	3.4	
Glutamic acid	5.8	
Hydroxyglutamic acid	0	
Histidine	0.9	
Arginine	8.2	
Lysine	5.9	
Cystine		0.16 (Looney; Folin and Looney; Jones, Gersdorff and Moeller)
Methionine		0.97 (Baernstein)
Tryptophan		0 (Looney; Folin and Looney; Jones, Gersdorff and Moeller; May and Rose)

concentration. Valine, isoleucine, hydroxyglutamic acid and tryptophan are lacking. Tyrosine and cystine are present in small amounts. According to the results obtained in the feeding

2. Dakin, H. D.: Amino Acids of Gelatin, J. Biol. Chem. **44**: 499 (Nov.) 1920. Looney, J. M.: The Colorimetric Estimation of Tyrosine, Tryptophane, and Cystine in Proteins, ibid. **69**: 519 (Aug.) 1926. Folin, O., and Looney, J. M.: Colorimetric Methods for the Separate Determination of Tyrosine, Tryptophane and Cystine in Proteins, ibid. **51**: 421 (April) 1922. Jones, D. B.; Gersdorff, C. E. F., and Moeller, O.: The Tryptophane and Cystine Content of Various Proteins, ibid. **62**: 183 (Nov.) 1924. Baernstein, H. D.: The Determination of Methionine in Proteins, ibid. **97**: 663 (Sept.) 1932. Bergmann, M., and Stein, W. H.: A New Principle for the Determination of Amino Acids, and Its Application to Collagen and Gelatin, ibid. **128**: 217 (April) 1939. May, C. E., and Rose, E. R.: The Tryptophane Content of Some Proteins, ibid. **54**: 213 (Oct.) 1922. Bergmann, M.: Complex Salts of Amino Acids and Peptides: II. Determination of l-Proline with the Aid of Rhodanilic Acid. The Structure of Gelatin, ibid. **110**: 471 (July) 1935.

experiments of Rose and his collaborators,[3] the essential amino acid threonine is present in much smaller amounts in gelatin than in the casein of milk. To date the following amino acids have been shown by feeding experiments with animals to be essential for growth: arginine, leucine, isoleucine, histidine, lysine, methionine, phenylalanine, tryptophan, threonine and valine. Future investigations may show that the animal body is incapable of synthesizing other amino acids.[4] According to available data, gelatin may be classed as an incomplete protein because it lacks or contains too low a concentration of isoleucine, tryptophan and possibly other amino acids.

It is the opinion of the Council that the amino acid composition of gelatin is of no practical disadvantage unless gelatin is the sole source of protein in the diet. The essential amino acids that are lacking in gelatin can and should be obtained from other sources. No one would attempt to live on a diet in which gelatin forms the sole source of protein. As a matter of fact, several investigators have attempted this feat as a scientific experiment without success. Kauffmann[5] in 1905 reported some feeding experiments in which he derived nitrogen entirely from gelatin supplemented with tyrosine, cystine and tryptophan and remained in nitrogen balance for a few days. His experiments, however, are inconclusive and are of historic interest only.

Gelatin, because of its swelling properties, cannot be eaten readily in the dry form or sprinkled on cereal. It is usually consumed as a solution which, if the concentration of gelatin is approximately 1 per cent or more, forms a gel on cooling. An ordinary serving of a gelatin dessert contains about 2.5 Gm. of gelatin. Recipes have been suggested in which a concentration of gelatin as high as 10 per cent may be prepared in the form of hot soup. It requires considerable ingenuity, however, to formulate a menu that contains more than about an ounce (28 Gm.) of dry gelatin per day.

Much information of lasting value has been gained through experimental studies of the nutritive advantages and disadvantages of gelatin. The report by Jackson and his collaborators[6] includes a review of the work to 1929 on the supplementary

---

3. McCoy, R. H.; Meyer, C. E., and Rose, W. C.: Feeding Experiments with Mixtures of Highly Purified Amino Acids: VIII. Isolation and Identification of a New Essential Amino Acid, J. Biol. Chem. **112**: 283 (Dec.) 1935. Meyer, C. E., and Rose, W. C.: The Spatial Configuration of Alpha Amino Beta-Hydroxy-N-Butyric Acid, ibid. **115**: 721 (Oct.) 1936. Ellis, R. H., and Rose, W. C.: Feeding Experiments with Mixtures of Highly Purified Amino Acids: II. The Supplemental Effect of Proteins, ibid. **94**: 167 (Nov.) 1931.

4. There is conclusive evidence that methionine can replace cystine; cystine, however, is not able to replace methionine (Womack, M.; Kremmerer, K. S., and Rose, W. C.: The Relation of Cystine and Methionine to Growth, J. Biol. Chem. **121**: 403, 1937).

5. Kauffmann, cited in The Nutritional Significance of Gelatin, report of the Council on Foods, J. A. M. A. **107**: 2132 (Dec. 26) 1936.

6. Jackson, R. W.; Sommer, B. E., and Rose, W. C.: Experiments on the Nutritive Properties of Gelatin, J. Biol. Chem. **80**: 167 (Nov.) 1928.

value of gelatin added to other proteins in the diet of rats. Thus it has been shown by Osborne and co-workers [7] that gelatin, which contains a relatively high concentration of lysine, will supplement gliadin, which contains about one tenth as much of this essential amino acid. However, the application of these observations to human nutrition is obscure. The human being does not ingest synthetic diets, and an actual deficiency of lysine in the diet has never been demonstrated.

Use of Gelatin in Treatment of Myopathies.—The use of gelatin (containing 25 per cent of aminoacetic acid) in the treatment of the myopathies has been discussed in the literature. The dose of aminoacetic acid in the treatment of myasthenia gravis or pseudohypertrophic muscular dystrophy usually is from 20 to 30 Gm. It should be apparent that gelatin can furnish only a small proportion of the proper dose of this amino acid. In the opinion of the Council it is improper for manufacturers to exploit gelatin in connection with the observations on the use of aminoacetic acid in the treatment of the myopathies. Even if it were possible to secure appreciable quantities of aminoacetic acid by eating large quantities of gelatin, the recommendation to do so is objectionable. Each patient requires a specific amount, and in the opinion of the Council, to try to take aminoacetic acid in the form of gelatin would be not only haphazard but in many cases ineffective.

Use of Gelatin in Treatment of Peptic Ulcer.—Experiments have also been made to determine the therapeutic value of gelatin in the management of peptic ulcer. Windwer and Matzner [8] administered a so-called high protein diet to 40 patients with peptic ulcer. This consisted of a mixed diet with hourly feedings of gelatin between meals. Seven doses, each containing 8 Gm. of gelatin dissolved in a small amount of water, were administered daily. The authors reported that symptomatic relief was obtained by 90 per cent of the patients studied; they concluded that this method, though not considered as specific, has a definite place in the management of peptic ulcer, especially when patients do not respond to drug therapy. Recent work [8a] also shows that gelatin feedings may be of value in the treatment of peptic ulcer.

It is well known that the person with peptic ulcer has periods of relapse and of relative freedom from symptoms. Further study before the claim can be considered established is definitely indicated. Certainly there is no justification for the widespread suggestion that patients may obtain relief for peptic ulcer by feeding themselves gelatin between meals.

7: Osborne, T. B.; Mendel, L. B., and Ferry, E. L.: Maintenance Experiments with Isolated Proteins, J. Biol. Chem. **13**: 233, 1912-1913

8. Windwer, C., and Matzner, M. J.: Peptic Ulcer—The Effect of High Protein Diet on the Behavior of the Disease, Am. J. Digest. Dis. **5**: 743 (Jan.) 1939.

8a. Brown, C. F. G., and Dolkart, R. E.: An Evaluation of the Therapy of Peptic Ulcer, J. A. M. A. **113**: 276 (July 22) 1939.

Effect of Gelatin on Fatigue.—Recently a study on the effect of gelatin on muscular fatigue was reported by Ray and coworkers.[9] They concluded that men given adequate amounts of gelatin (60 Gm. daily) are invariably able to increase the amount of work produced before fatigue sets in. They attributed this observed action of gelatin to the creatinogenic action of its amino acids, especially of aminoacetic acid, which makes up about one fourth of the weight of this protein, although no observations on the effects of feeding aminoacetic acid itself were reported by the authors.

It is the opinion of the Council[9a] that the evidence available at the present time is insufficient to warrant the claim that the ingestion of gelatin increases physical endurance or is an aid in preventing fatigue.

Effect of Gelatin on Digestibility of Milk.—Of particular interest to physicians is the evidence regarding the effect of the addition of gelatin to milk. This has been supposed to increase the digestibility of the milk, and in the past the use of gelatin in infant feeding was looked on with favor by pediatricians. It has been thought that gelatin as a colloid would coat the newly formed casein curds in the stomach and prevent their coalescence into larger curds. Some evidence has been obtained which indicates that the curd formed when milk plus gelatin is treated with acid tends to be softer than the curd formed with milk alone plus acid.

Clinical studies of the value of gelatin in infant feeding have yielded questionable or conflicting results. Hess and Chamberlain[10] reported a study in an outpatient department on infants fed gelatin. The gelatin was well tolerated, but there was a tendency toward the formation of foul-smelling, firm stools which were grayish yellow and which at times were passed with difficulty. Other infants receiving egg yolk in place of gelatin passed stools which were more plastic and in general were canary colored. Perlman[11] observed a slightly higher rate of growth in infants fed gelatin than in infants fed the same diet without gelatin. From the observations reported by Elterich, Boyd and Neff[12] as a result of a careful study of 11 infants under hospital supervision, it may be concluded that gelatin does not specifically accelerate growth but may increase the caloric intake.

---

9. Ray, G. B.; Johnson, J. R., and Taylor, M. M.: Effect of Gelatin on Muscular Fatigue, Proc. Soc. Exper. Biol. & Med. **40**: 157, 1939.

9a. Knox Gelatine Omitted from the List of Accepted Foods, Report of the Council on Foods, J. A. M. A. **113**: 127 (July 8) 1939.

10. Hess, J. H., and Chamberlain, I. M.: Gelatin Added to Diets of Artificially Fed Infants, J. A. M. A. **89**: 1423 (Oct. 22) 1927.

11. Perlman, H. H.: Comparative Value of Gelatin as an Accessory Infant Food, Arch. Pediat. **45**: 14 (Jan.) 1928.

12. Elterich, T. O.; Boyd, D. H., and Neff, A.: The Use of Gelatin as a Supplementary Food in the Infant's Dietary, Arch. Pediat. **47**: 286 (May) 1930.

The use of gelatin in the form of an isotonic solution which also contains dextrose and sodium chloride has been suggested by Kugelmass [13] and co-workers and by Halpern [14] for the prevention of loss of weight of newborn babies in the first few days of life. Senn,[15] however, while confirming the fact that loss in weight is not so great when this solution is used, concluded that it is not a safe therapeutic procedure because it occasionally gives rise to edema and fails to prevent dehydration fever.

Other Uses of Gelatin of Interest in Nutrition.—Because of its characteristic physical properties, gelatin has a number of uses in the food industry. For example, it is customary to incorporate about 0.5 per cent of gelatin in many ice cream mixtures [16]. It is added in order to improve the smooth consistency by enhancing the ability of the product to be whipped and in other ways. Gelatin may also be an important ingredient of confections such as marshmallows.

Allowable Claims for Gelatin.—In view of the available evidence the Council believes that gelatin properly made is a wholesome food, that it has special usefulness in adding variety to the diet when incorporated in nutritious soups or pleasant desserts, which appeal to the appetite of many persons, and that for these reasons it is useful in the diet of healthy persons or of sick or convalescent patients. Gelatin appears to be well tolerated. The claim that it is an aid in the digestion of milk, however, is in the opinion of the Council not established. The claim that it is of value as a source of aminoacetic acid in the treatment of some of the myopathies cannot be recognized; in the light of present evidence, gelatin has no special significance as a source of amino acids in the diet. Indeed, it is markedly deficient in certain essential amino acids. The Council on Foods cannot accept the claim that the eating of gelatin increases endurance or diminishes fatigue in normal persons. The supposed value of gelatin as a high protein food in the diet of the diabetic patient cannot be recognized, although gelatin may advantageously be included in such a diet. The claim that gelatin is of therapeutic value in the management of peptic ulcer is not yet considered to be established. On the basis of the evidence presented, no claims can be recognized for the usefulness of gelatin in the prevention of vomiting, diarrhea, constipation and infection in infants.

---

13. Kugelmass, I. W.; Berggren, R. E. L., and Cummings, M.: Preventing Loss of Weight in the newborn, Am. J. Dis. Child. **46**: 280 (Aug.) 1933.

14. Halpern, L. J.: The Prevention of Initial Loss of Weight in the Newborn by the Use of a Hydrating Solution, J. Pediat. **5**: 40 (July) 1934.

15. Senn, M. J. E.: The Effects of a Gelatin Hydrating Solution on the Newborn, J. Pediat. **7**: 352 (July) 1935.

16. Fundamentals of Dairy Science, ed. 2. American Chemical Society Monograph, New York, Reinhold Publishing Corporation, 1935, p. 264.

The listed products of the following firms stand accepted:

The American Agricultural Chemical Company, Detroit.
KEYSTONE BRAND GELATIN of the following grades, which differ in jelly strength: AA, CONFECTIONERS' O, CONFECTIONERS' OO, EASYMIX, JELRITE, KWIKJEL, MIXRITE, NUMBER 431, NUMBER 546, SILVER LABEL, SPECIAL B. A. I., WHIPRITE and XLO.

Atlantic Gelatin Company, Inc., Woburn, Mass.
ATLANTIC BRAND SUPER-CLARIFIED GELATIN.

Thomas W. Dunn Company, New York.
DUNN'S DIAMOND "D" BRAND GELATIN of the following grades, which differ in jelly strength: SUPER, AA, A, 1 EXTRA and 1.

Grayslake Gelatin Company, Grayslake, Ill.
GRAYSLAKE BRAND GELATIN.

Jell-Well Dessert Company, Ltd., Los Angeles.
JELL-WELL BRAND GELATIN.

Minute Tapioca Company, Inc., Orange, Mass.
MINUTE BRAND GELATIN.

Swift & Company, Chicago.
SWIFT BRAND GELATIN of the following grades, which differ in jelly strength: ATLAS, CELERO, CREMELAC, ECONOMIX, FINEMIX, FREZRITE, PROTECTOR, SEECLEAR, STABILO, SUPERLA, SUPERCLEAR, SUPERTEX, SUPERWHIP, TEXTURA, VELVATEX and VISCOMIX.

United Chemical and Organic Products Company, Chicago.
U-COP-CO BRAND GELATIN, FLAKED
U-COP-CO BRAND GELATIN, GRANULATED.

Wilson & Company, Chicago.
WILSON BRAND GELATIN, FLAKED.
WILSON BRAND GELATIN, GRANULATED.

The following firms distribute under their own labels gelatin products purchased from manufacturers of accepted products now privileged to use the Seal of Acceptance. The labels and advertising conform to the Rules and Decisions of the Council.

George W. Caswell Company, San Francisco.
CASWELL BRAND GELATIN.

Cherry-Burrell Corporation, Chicago.
QUAKER BRAND GELATIN.
VOGT BRAND GELATIN.

Meyer Blanke Company, St. Louis.
HERCULES JUSTRITE BRAND GELATIN.
TITAN JUSTRITE BRAND GELATIN.

IODIZED SALT

The history of endemic goiter has been reviewed so many times that it need not be discussed here. The belief that lack of iodine is in some way connected with the incidence of simple endemic goiter is worldwide,[17] and faith in the beneficial effect of iodine on this form of thyroid enlargement is well founded.

17. McClendon, J. F.: The Distribution of Iodine with Special Reference to Goiter, Physiol. Rev. 7: 189 (April) 1927.

Marine[18] reported data which show that children taking small amounts of iodine in the form of iodized salt are not so likely to have endemic goiter as those who do not take it. In 1937 Cowie and co-workers[19] reported a marked decrease in the incidence of goiter among children using iodized salt. They advocated that the use of iodized salt be continued through the period of adolescence at least.

Allowable Claims for Iodized Salt.—The Council on Foods has adopted the following decision regarding the use of iodized salt:

Iodine is a chemical element essential for normal nutrition. Food and drink may inadequately supply this element, and consequently an iodine deficiency disease—simple goiter—may develop. The prevention of goiter is conceived to be largely a nutritional problem, depending on the regular addition of a definite small quantity of an iodine compound or an adequate quantity of an iodine-rich food to the diet inadequate in this element. A favorable practical method for dispensing the necessary additional iodine to the public to supplement that naturally present in food and drink is the fortification of table salt with a definite quantity of a suitable iodine compound.

Although supplemental iodine supplied through salt or other special foods may prevent goiter that would otherwise occur or cure an incipient condition, the simple administration of iodine in this manner is not a "cure all." The prevention of goiter is a matter of normal nutrition; the cure of goiter is a medical problem. All patients with goiter should be under efficient medical supervision.

The value of iodized salt in the prevention of simple goiter has been demonstrated. It also is known that the ingestion of additional iodides by some persons, those with adenomatous goiter, for example, is harmful, but in reviewing available evidence there is no report that harm has come from the use of iodized salt. As a precaution, the Council emphasizes that persons over 30 years of age with any swelling of the throat should not use iodized salt unless they do so under the direction of a competent physician.

An accepted iodized salt shall contain one part sodium or potassium iodide to 5,000 parts salt (approximately 160 parts iodine per million parts salt), or the iodine equivalent of any other suitable iodine compound. Iodized salt containing more than this quantity is considered a medicament not to be advertised to the public for table and cooking use.

---

18. Marine, D.: The Pathogenesis and Prevention of Simple or Endemic Goiter, J. A. M. A. 104: 2334 (June 29) 1935.

19. A Study of the Effect of the Use of Iodized Salt on the Incidence of Goiter: First Official Report of the 1935 Goiter Survey of Michigan, J. Michigan M. Soc. 36: 647 (Sept.) 1937.

The listed products of the following firms stand accepted.

The Barton Salt Company, Hutchinson, Kan.
BARTON'S BRAND IODIZED FREE RUNNING SALT.

The Carey Salt Company, Winnfield, La.
CAREY-IZED BRAND IODIZED SALT.
PIONEER BRAND IODIZED SALT.

General Foods Corporation, New York.
Product distributed by Diamond Crystal Salt Company, Inc., St. Clair, Mich.
DIAMOND CRYSTAL BRAND IODIZED SALT.

International Salt Co., New York.
PURITY BRAND IODIZED SALT
STERLING BRAND IODIZED SALT.

Jefferson Island Salt Co., Inc., Louisville, Ky.
Product packed by Jefferson Island Salt Mining Co., Inc., Jefferson Island, La.
JEFFERSON ISLAND BRAND IODIZED SALT.

Leslie Salt Company, San Francisco.
LESLIE BRAND IODIZED SALT.

Morton Salt Company, Chicago.
MORTON'S BRAND IODIZED SALT.

The Ohio Salt Company, Wadsworth, Ohio.
CHIPPEWA BRAND IODIZED SALT.

The Watkins Salt Company, Watkins Glen, N. Y.
WATKINS BRAND IODIZED SALT.

Worcester Salt Company, New York.
WORCESTER BRAND IODIZED SALT, containing in addition to the usual amounts of potassium iodide and tricalcium phosphate small amounts of thiosulfate and calcium oxide which tend to stabilize the iodine content of the salt.

The following firms distribute under their own labels salt products purchased from manufacturers of accepted products now privileged to use the Seal of Acceptance. The labels and advertising conform to the Rules and Decisions of the Council.

Mulkey Salt Company, Detroit.
MULKEY'S BRAND IODIZED SALT.

Plee-Zing, Inc., Chicago.
PLEE-ZING BRAND IODIZED SALT.

Twin City Wholesale Grocer Co., Fargo, N. D., St. Paul and Minneapolis.
FAIRWAY BRAND IODIZED SALT.

Twin Ports Wholesale Grocer Co., Duluth, Minn., and Superior, Wis.
FAIRWAY BRAND IODIZED SALT.

Wood County Grocery Co., Wisconsin Rapids, Wis.
FAIRWAY BRAND IODIZED SALT.

COFFEE, TEA AND SIMILAR PRODUCTS

Coffee

This beverage is derived from the roasted seeds of the coffee tree, Coffea arabica, and other related species. These trees apparently are indigenous to Ethiopia and other parts of tropical

Africa but were introduced into certain parts of Asia, and the East Indies and later into the West Indies, Central America and South America.

Coffee is known to have been commonly used as a beverage in Ethiopia in the fifteenth century. At that time it was said to have been drunk there from time immemorial. The Coffee tree was introduced into Arabia in the fifteenth century. The beverage immediately became popular with all classes. In the sixteenth century it was widely used in this country, becoming essentially the national beverage. From Arabia both the coffee plant and the custom of coffee drinking spread. In the seventeenth century coffee was introduced into Europe, and coffee houses were opened in Constantinople and Vienna and soon after in London and other cities.

Up to the close of the seventeenth century the commercial coffee supply of the world was secured from the Province of Yemen in South Arabia, where the true Mocha coffee is still grown; but about this time its successful introduction into Java was accomplished. Its introduction into South America dates from 1718. At that time it was introduced by the Dutch into Surinam, from where its spread into Brazil and other countries of the Western Hemisphere was comparatively easy. Three fourths of the world's coffee supply at the present time comes from the plantations of Brazil.

Before the coffee seed is used in preparation of the beverage, it must undergo the process of roasting, during which it swells somewhat, its color is changed to dark brown or almost black, depending on the degree of the roast, and it acquires the characteristic odor and flavor of roasted coffee.

Chemical Composition.—Raw coffee, besides water, contains protein, the alkaloids caffeine and caffearine, oil, sugar, dextrins, pentosans, cellulose, caffetannic acid (chlorogenic and coffalic acids), ash and various acids and minor constituents. Roasting drives off most of the water, caramelizes a large part of the sugar, reduces the caffetannic acid by about half and develops the coffee aroma. The physical nature of the bean is also altered by roasting, the raw bean being tough and horny whereas the roasted bean is brittle.

The range of composition of accepted brands of coffee is listed in the tabulation.

Range of Composition of Coffee (Submitted by Manufacturers)

Constituent	Percentage
Moisture	3.6- 5.0
Ash	3.8- 4.0
Fat (ether extract)	10.3-15.6
Total nitrogen	2.1- 2.6
Protein (N x 6.25)	10.6-14.8
Caffeine	0.9- 1.4
Crude fiber	11.3-21.1
Carbohydrates other than crude fiber (by difference)	44.8-54.2

Caffeine and Theobromine Content of Coffee and Similar Beverages—Caffeine (trimethylxanthine) and theobromine (3.7 dimethylxanthine) are alkaloids, organic substances containing nitrogen, which have markedly stimulating effects. Caffeine is the principal alkaloid of coffee as well as of cacao. For medicinal purposes the drug caffeine is used in amounts ranging from

TABLE 3.—*Caffeine and Theobromine in Average Servings of Beverages*

Beverage	Coffee, Tea and Cocoa as Commonly Prepared: Amounts Used in Preparation of Average 6 Oz. Serving	Caffeine and Theobromine, Grains
Coffee	1 tablespoonful	1.8
Coffee	2 tablespoonfuls	3.6
Tea	1 teaspoonful	1.8
Cocoa	1½ teaspoonfuls	1.2
Cocoa	¾ teaspoonful	0.5

Chocolate-Flavored Beverages

Chocolate-Flavored Beverage Bases*	Caffeine,† Grains	Theobromine,† Grains	Caffeine† and Theobromine,† Grains
Bowey's	2.0	0.8	2.8
Bradway's	0.2	0.6	0.8
Chocalose	0.2	0.8	1.0
Choc-Lade Powder	...	...	0.4
Choclatier	0.2	2.6	2.8
Five-O Powder	...	...	0.4-0.6
Krim-Ko Powder	...	...	0.2
Krim-Ko Syrup	...	...	0.4-0.6
Hershey Syrup	0.1	1.2	1.3
Kingco	0.4	2.1	2.5
Rockwood's Syrup	0.2	1.3	1.5
Vitavose, Chocolate Flavored	0.2	0.6	0.8

* Products listed stand accepted by the Council on Foods. Figures are based on reports of analyses submitted by the firms.

† Amount contained in the portion of base to be added to 8 ounces of milk, as recommended by the firm.

0.06 to 0.3 Gm. and theobromine in amounts from 0.5 to 1 Gm. as a diuretic, as a cardiac and respiratory stimulant, as a psychic muscular stimulant and when peripheral actions are desired. Theobromine is thought to be a more powerful stimulant for respiration and for the heart than caffeine. As a diuretic theobromine is also more efficient than caffeine.[20]

20. Sollmann, T.: A Manual of Pharmacology, ed. 5, Philadelphia, W. B. Saunders Company, 1936, p. 271.

Whether the constant use of caffeine beverages is harmful, harmless or merely indifferent is still a debated question. Perhaps the majority of workers believe that normal adults may indulge in moderate amounts without injury or possibly even with benefit. Others believe that the continued use of the drug, even in moderate amounts, may have a deleterious effect, especially on the nervous system. There is fairly unanimous agreement that excessive amounts are definitely injurious and that even moderate amounts are contraindicated for neurotic or nervous persons and in certain pathologic conditions.

The question of whether or not beverages containing caffeine and theobromine may be used by children is perennial. Unfortunately, it does not seem possible to specify a maximum amount of caffeine and theobromine which may be present in a product recommended for children. The habits and customs of different people vary greatly, and the problem is complex. It is generally recognized that unrestricted quantities of tea, coffee and other purine-containing beverages are not desirable for children. It is likewise generally recognized that a child should drink milk. Because a child will take only a limited amount of fluid in a day, it is important that coffee, tea and other purine-containing beverages do not replace milk.

Caffeine-Free Coffee

Several processes have been patented for the removal of caffeine from coffee on the assumption that this is an injurious principle. One process depends on extraction with water, removal of caffeine from this extract and return of the residue to the coffee.

Analytic reports submitted by the manufacturers of accepted brands of caffeine-free coffee show that 97 per cent of the caffeine has been removed. The composition of accepted brands of decaffeinated coffee (as submitted by the manufacturers) is as follows: moisture 3.1 per cent, water-soluble solids 24.5 per cent, ash 3.9 per cent, fat 15.1 per cent, protein (N $\times$ 6.25) 6.9 per cent, caffeine 0.03 per cent, caffetannic acid 1.1 per cent, crude fiber 22.4 per cent and carbohydrates other than crude fiber (by difference) 48.6 per cent.

Substitutes for Coffee

Chicory.—Chicory is a root vegetable included in the Compositae. It is best known dried, ground and roasted as an admixture to coffee. In some sections, for example, in New Orleans, chicory is regarded as a desirable addition to coffee. In the opinion of many it improves the flavor. Its presence in commercial preparations of whole or ground coffee without

a declaration on the label is improper and a violation of the definition and standard for coffee set forth by the Federal Government.

COFFEE. The seed of cultivated varieties of Coffea arabica, C. liberica, and C. robusta.

a. Green coffee, raw coffee, unroasted coffee, is coffee freed from all but a small portion of its spermoderm, and conforms in variety and in place of production to the name it bears.

b. Roasted coffee, "coffee," is properly cleaned green coffee which by the action of heat (roasting) has become brown and has developed its characteristic aroma.

Winton and Winton[21] reported the composition of dried and roasted chicory root to be as follows:

Composition of Chicory Root

Constituent	Percentage
Moisture	12.3
Protein	6.1
Fat	2.3
Sugar .	11.1
Caramel	13.4
Inulin	5.9
Nitrogen-free extract	63.8
Crude fiber	0.2
Ash .	5.8
Soluble solids	60.1

As a result of roasting chicory root, a tarry oil is formed. Grafe[22] stated that this oil is analogous to coffee oil and that it contains 63.5 per cent acetic acid, 5.4 per cent valeric acid, 2.5 per cent arolein, 2.3 per cent furfurol and 23.5 per cent furfuryl alcohol.

The important distinction of coffee from mixtures of coffee and chicory lies in the percentage of reducing sugars in the water extract. La Wall and Forman[23] reported that coffee extract contains only 1.92 to 2.64 per cent reducing sugars, whereas two samples of chicory extract contained 27.67 and 25.20 per cent, and an extract of a mixture of 95 per cent coffee and 5 per cent chicory contained 4.62 per cent. Chicory added to the infusion brings out equally strong distinctions.

Cereal Substitutes.—For those who cannot tolerate the physiologic action of coffee there are available cereal substitutes, which consist of a mixture of bran, wheat and molasses, ground

21. Winton, A. L., and Winton, K. B.: The Structure and Composition of Foods, New York, John Wiley & Sons, Inc., 1939, vol. 4, p. 171.

22. Grafe, V.: Untersuchungen über die zichorie, Biochem. Ztschr. 68: 1, 1915.

23. La Wall, H. C., and Forman, L.: The Detection of Chicory in Decoctions of Chicory and Coffee, Am. J. Pharm. 85: 535 (Dec.) 1913.

and roasted. Cereal substitutes contain no stimulating ingredient and are designed to be used with milk or water. Woods and Merrill[24] examined eight such products and reported the following composition: soluble protein 1.4 to 5.6 per cent, soluble carbohydrates 13.4 to 44.9 per cent, soluble ash 1.5 to 4.1 per cent and total soluble solids 22.4 to 51.2 per cent.

The Council has accepted a few such products. The range of composition reported by the manufacturers is as follows:

Range of Composition of Cereal Substitutes (Submitted by Manufacturers)

Constituent	Percentage
Moisture	1.0- 2.8
Ash	5.9- 8.3
Fat (ether extraction method)	0.0- 2.7
Protein (N × 6.25)	6-6-12.3
Crude fiber	0.0- 9.5
Carbohydrates other than crude fiber (by difference)	68.6-82.3
Caffeine	None

Tea

According to definitions of the Federal Government, tea consists of the tender leaves, leaf buds and tender internodes of different varieties of Thea sinensis L., prepared and cured by recognized methods of manufacture. It conforms in variety and place of production to the name it bears, contains not less than 4 per cent nor more than 7 per cent of ash and meets the provisions of the Act of Congress approved March 2, 1897, as amended, regulating the importation and inspection of tea.

In China tea has been growing for four thousand years or more. It was introduced into Japan during the thirteenth century and into India, Ceylon, Java and other parts of the East Indies during the nineteenth century. Today India and Ceylon lead in exporting tea, China having fallen far behind. Green tea is steamed to destroy enzymes and dried immediately after picking, thus retaining the chlorophyll. To make black tea it is only necessary that the unsteamed leaves are fermented in heaps before being dried. In both varieties the leaves are usually rolled to improve the appearance.

The common grades of tea are flowery pekoe (leaf buds), orange pekoe (half-grown leaf) and pekoe (first leaf). Chinese tea is often perfumed by being mixed with fragrant jasmine, gardenia and orange flowers.

The chemical composition of tea varies with the maturity of the leaf and the method of preparation for use (curing). The

24. Woods and Merrill, cited by Winton and Winton,[21] p. 142.

range of composition of accepted brands of tea as submitted by the manufacturers is shown in the tabulation.

Range of Composition of Tea (Submitted by Manufacturers)

Constituent	Percentage
Moisture	7.0- 7.5
Ash	5.4- 5.9
Water-soluble ash	3.4- 3.8
Acid-soluble ash	0.1- 0.2
Fat (purified petroleum benzine extract)	0.6- 1.3
Caffeine	2.3- 3.6
Crude fiber	10.8-21.6
Alkalinity of water-soluble ash (cc. of normal alkaline solution required to neutralize 100 Gm. tea)	31.0-39.0
Volatile ether extract	0.02- 0.3
Tannic acid	4.9-16.3

Tea contains a considerable amount of caffeine and tannic acid. Winton reported the following limits for caffeine in tea on the dry basis: Ceylon 2.7 to 4.89 per cent, Indian 3.86 to 4.89 per cent, Chinese 2.42 to 3.78 per cent, Japan 2.60 to 2.93 per cent and Java Pecco 3.41 to 4.10 per cent.

Carpenter and Harler [25] reported that fresh leaves contain 25 to 30 per cent tannic acid, which is reduced to about 15 per cent by fermentation. The color of green leaves is influenced by the tannic acid content.

The listed products of the following firms stand accepted:

Canova Foods, Inc., Memphis, Tenn.

CANOVA BRAND COFFEE, GROUND.

General Foods Corporation, New York.

KAFFEE-HAG BRAND DECAFFEINATED COFFEE, a blend of selected roasted coffee from which almost all the caffeine has been removed.

Analysis (submitted by manufacturer).—Moisture 1.6%, water-soluble solids 22.1%, ash 4.2%, fat (petroleum ether extract) 16.9%, protein (N × 6.25) 12.1%, caffeine 0.03%, crude fiber 11.5%, tannins 3.3%, carbohydrates other than crude fiber (by difference) 53.7%.

Product distributed by Postum Company, Inc., New York.

INSTANT POSTUM, dried water extract of a blend of roasted wheat bran, whole wheat and molasses.

Analysis (submitted by manufacturer).—Moisture 2.8%, total solids 97.2%, ash 8.3%, fat (ether extract) none, protein (N × 6.25) 6.6%, crude fiber none, carbohydrates (by difference) 82.3%, calcium (Ca) 0.15%, phosphorus (P) 0.86%.

Calories.—3.6 per gram; 102 per ounce.

POSTUM, a ground mixture of roasted wheat bran, whole wheat and molasses.

Analysis (submitted by manufacturer).—Moisture 1.0%, total solids 99.0%, ash 5.9%, fat (ether extract) 2.7%, protein (N × 6.25) 12.3%, crude fiber 9.5% carbohydrates other than crude fiber (by difference) 68.6%.

Calories.—3.5 per gram; 99 per ounce.

Product distributed by Sanka Coffee Corporation, New York.

SANKA BRAND COFFEE, with 97 per cent of the caffeine removed.

25. Carpenter, P. H., and Harler, C. R.: Tannin in the Tea Leaf, Quart. J. Sc. Dept. Indian Tea A., 1922, pt. 3, p. 99; Internat. Rev. Sc. Practice Agric. 1:679, 1923; abstracted, Chem. Abstr. 18:2022, 1924.

Heinr. Franck Sons, Inc., Flushing, New York.

FRANCK TABLETS, roasted chicory root, ground and pressed into tablets.

Analysis (submitted by manufacturer).—Moisture 3.5%, total solids 96.5%, ash 4.7%, water-soluble ash 2.9%, acid-insoluble ash 0.4%, fat (purified petroleum benzine extract) 3.6%, protein (N × 6.25) 7.3%, crude fiber 7.9%, reducing sugars as invert sugar 8.6%, sucrose 0.4%, carbohydrates other than crude fiber (by difference) 73.0%, water extract 69.0%.

Calories.—2.5 per gram; 71 per ounce.

John H. Wilkins Company, Inc., Washington, D. C.

WILKINS BRAND COFFEE, GROUND

WILKINS BRAND ORANGE PEKOE TEA.

McCormick & Company, Inc., Baltimore.

BANQUET BRAND EXTRA FANCY CEYLON TEA.

BANQUET BRAND EXTRA FANCY INDIA TEA.

BANQUET BRAND EXTRA FANCY ORANGE PEKOE TEA.

National Grocery Company, Seattle.

Product distributed by Reliance Pure Foods, Seattle.

RELIANCE BRAND COFFEE, coarsely ground.

Winston & Newell Company, Minneapolis.

18-K BRAND COFFEE, ground, roasted, vacuum packed.

18-K BRAND COFFEE, roasted whole bean coffee, not vacuum packed.

CHOCOLATE, COCOA AND CHOCOLATE FLAVORED BEVERAGE BASES

Chocolate is derived from the seeds of Theobroma cacao, a tree indigenous to Brazil and Central America. Cocoa is chocolate with the fat removed. After the hulls are removed from the cacoa beans, the beans are crushed and freed from the bean germ. The resulting coarsely crushed product is known as cocoa nibs. These nibs are ground, forming a thin paste which on cooling sets to a hard cake. This is known as plain chocolate. In the preparation of cocoa about half of the fat is extracted. The chief difference between cocoa and chocolate, then, is in the proportion of fat, although starch, sugar or other substances may be added to either.

Federal Standards and Definitions.—Federal standards and definitions of these products follow:

1. CACAO BEANS, COCOA BEANS. The seeds of trees belonging to the genus Theobroma, especially those of T. cacao L. and closely related species.

2. CACAO NIBS, COCOA NIBS, "CRACKED COCOA." Roasted or dried cacao beans, broken and freed from germ and from shell or husk.

3. CACAO BUTTER, COCOA BUTTER. (See Edible Vegetable Oils and Fats.)

4. CHOCOLATE, PLAIN CHOCOLATE, BITTER CHOCOLATE, CHOCOLATE LIQUOR, CHOCOLATE PASTE, BITTER CHOCOLATE COATING. The solid or plastic mass obtained by grinding cacao nibs. It contains not less than 50 per cent of cacao fat and, on the moisture- and fat-free basis, not more than 8 per cent of total ash, not more than 0.4 per cent of ash insoluble in hydrochloric acid, nor more than 7 per cent of crude fiber.

5. SWEET CHOCOLATE, SWEET CHOCOLATE COATING. Chocolate mixed with sugar and/or dextrose, with or without the addition of cacao butter, spices, or other flavoring materials. It contains, on the moisture-, sugar-, and fat-free basis, no greater percentage of total ash, ash insoluble in hydrochloric acid, or crude fiber, respectively, than is found in moisture- and fat-free chocolate.

6. MILK CHOCOLATE, SWEET MILK CHOCOLATE. The product obtained by grinding chocolate with sugar and/or dextrose, with the solids of whole milk, or the constituents of milk solids in proportions normal for whole milk, and with or without cacao butter, and/or flavoring material. It contains not less than 12 per cent of milk solids.

7. COCOA, POWDERED COCOA. Chocolate deprived of a portion of its fat and pulverized. It contains, on the moisture- and fat-free basis, no greater percentage of total ash, ash insoluble in hydrochloric acid, or crude fiber, respectively, than is found in moisture- and fat-free chocolate.

8. "BREAKFAST COCOA." Cocoa which contains not less than 22 percent of cacao fat.

9. SWEET COCOA, SWEETENED COCOA. Cocoa mixed with sugar and/or dextrose. It contains not more than 65 percent of total sugars in the finished product, and, on the moisture-, sugar-, and fat-free basis, no greater percentage of total ash, ash insoluble in hydrochloric acid, or crude fiber, respectively, than is found in moisture- and fat-free chocolate.

10. SWEET MILK COCOA. The product obtained by grinding cocoa with sugar and/or dextrose, with the solids of whole milk, or the constituents of milk solids in proportions normal for whole milk, and with or without flavoring material. It contains not less than 12 percent of milk solids.

11. DUTCH-PROCESS CHOCOLATE, "ALKALIZED CHOCOLATE," and DUTCH-PROCESS COCOA, "ALKALIZED COCOA." Modifications, respectively, of chocolate and cocoa, in that in their manufacture an alkali carbonate or other suitable alkaline substance has been employed. In the preparation of these products not more than 3 parts by weight of potassium carbonate, or the neutralizing equivalent thereof in other alkaline substances, are added to each 100 parts by weight of cacao nibs. The finished products conform to the standards for chocolate and cocoa respectively, due to allowance being made for the kind and amount of alkaline substance added.

Chocolate-flavored beverage bases are compounded of a variety of ingredients, including chocolate, cocoa, maltose, dextrose, skimmed milk, cane sugar, malt extract, powdered whole eggs, tapioca flour, dried banana, vanilla extract, vanillin, bone calcium phosphate and iron and ammonium citrates. Approximately 1 ounce of a chocolate-flavored beverage base is required to make an 8 ounce serving of beverage. Obviously, the nutritional value of the beverage base depends on the kinds and amounts of ingredients of which it is compounded. Beverage bases containing malt or skimmed milk may have a higher vitamin potency, but specific vitamin claims are not allowed unless protocols of vitamin assays are provided.

The caffeine and theobromine content of all beverage bases must be furnished, together with the formula and analysis, before the Council considers acceptance. Beverage bases with a relatively low theobromine and caffeine content may be advertised for use in the preparation of beverages for children. At present there are no federal definitions and standards for chocolate-flavored bases.

The beverage bases accepted by the Council are fabricated for home, fountain and dairy use. Acceptance of chocolate-flavored beverage bases used exclusively in the dairy trade for the manufacture of chocolate-flavored drinks is not granted until the resulting beverages are acceptable to the Council. These beverage bases are discussed in section VIII, entitled "Milk and Milk Products Other than Butter."

Krim-Ko Chocolate Flavored Syrup and Powder are accepted beverage bases, and Krim-Ko Chocolate Flavored Drinks, distributed by various dairies, are accepted beverages prepared from these bases. For a discussion of chocolate-flavored milk drinks see section VIII.

Allowable Claims.—Special recommendations for children are not permissible for foods consisting largely of chocolate or cocoa which contain considerable quantities of theobromine and caffeine; no objection will be taken, however, to such recommendations in the case of foods that are merely flavored with chocolate or cocoa and which, in quantities likely to be consumed, are free from any probable effects due to theobromine or caffeine, provided the recommendations are permissible for the basic foods themselves.

The chocolate, cocoa and chocolate beverage bases that stand accepted by the Council are listed. The ingredients and analyses of each product are given.

The listed products of the following firms stand accepted:

Borcherdt Malt Extract Company, Chicago.

CHOCALOSE BRAND CHOCOLATE FLAVORED POWDER, a powdered beverage base containing malt extract, chocolate, maltose, dextrose, bone calcium phosphate and iron and ammonium citrates.

Analysis (submitted by manufacturer).—Moisture 3.1%, total solids 96.9%, ash 5.5%, fat (ether extract) 7.2%, protein (N × 6.25) 8.3%, reducing sugars (as maltose) 66.3%, dextrose 9.5%, carbohydrates (by difference) 75.9%, caffeine 0.06%, theobromine 0.23%, calcium (Ca) 1.36%, phosphorus (P) 1.50%, iron (Fe) 0.094%, magnesium (Mg) 0.90%, potassium (K) 0.17%, sodium (Na) 0.01%, sulfur (S) 0.06%, copper trace, manganese trace, zinc trace.

Calories.—4.02 per gram; 114 per ounce.

Vitamins.—Biologic assay (1936) showed 2.59 international units of vitamin B_1 per gram; 74 units per ounce.

Bowey's Inc., Chicago.

BOWEY'S BRAND HOT CHOCOLATE POWDER, a beverage base containing powdered chocolate liquor, cane sugar and skimmed milk flavored with vanilla extract.

Analysis (submitted by manufacturer).—Moisture 1.0%, total solids 99.0%, ash 2.4%, fat (ether extract) 18.5%, protein (N × 6.25) 11.2%, sucrose 48.0%, crude fiber 1.1%, carbohydrates other than crude fiber (by difference) 65.8%, theobromine 0.29%, caffeine 0.11%.

Calories.—4.75 per gram; 135 per ounce.

The Bradway Chocolate Company, Inc., New Castle, Ind.

BRADWAY BRAND CHOCOLATE FLAVORED SYRUP, a liquid beverage base containing a cooked, homogenized mixture of cane sugar, water tapioca, flour, cocoa, chocolate, sodium chloride, artificial flavoring and tartaric acid.

Analysis (submitted by manufacturer).—Moisture 19.6%, total solids 80.4%, ash 1.6%, fat (ether extract) 4.7%, protein (N × 6.25) 2.8%, sucrose 25.4%, reducing sugars as invert sugar 30.9%, crude fiber 0.5%, carbohydrates other than crude fiber (by difference) 70.8%, caffeine 0.055%,[26] theobromine 0.21%.[26]

Calories.—3.37 per gram; 96 per ounce.

Chocolate Sales Corporation, Hershey, Pa. *See* Hershey Chocolate Corporation, Hershey, Pa.

26. Calculated from an analysis of cocoa and chocolate.

Doral Food Products Company, Inc., New York.

KINGCO BRAND CHOCOLATE FLAVORED POWDER, a powdered beverage base containing sweetened malted milk, skimmed milk, Dutch cocoa and whole eggs.

Analysis (submitted by manufacturer).—Moisture 4.2%, total solids 95.8%, ash 3.3%, fat (Mojonnier method) 2.7%, protein (N × 6.25) 11.3%, sucrose 48.0%, lactose 12.8%, maltose 2.9%, crude fiber 0.7%, carbohydrates other than crude fiber (by difference) 77.8%, caffeine 0.10%, theobromine 0.47%, protein (N × 6.25) 7.5%, lecithin (P_2O_5) 0.019%, lecithin (calculated to whole egg solids) 1.8%, lecithin (calculated to whole egg) 6.8%.

Calories.—3.80 per gram; 108 per ounce.

Hershey Chocolate Corporation, Hershey, Pa., products distributed by Chocolate Sales Corporation, Hershey, Pa.

HERSHEY'S BRAND BAKING AND DRINKING CHOCOLATE UNSWEETENED, ground cacao nibs, or chocolate liquor, in cake form.

HERSHEY'S BRAND CHOCOLATE FLAVORED SYRUP, a liquid beverage base containing cane sugar, water, cocoa and invert sugar (prepared by hydrolyzing sucrose with U. S. P. hydrochloric acid and subsequently neutralizing the acid with U. S. P. sodium carbonate).

Analysis (submitted by manufacturer).—Moisture 38.2%, total solids 61.8%, ash 0.7%, ash insoluble in water 0.3%, ash insoluble in acid 0.02%, fat 1.0%, protein (noncaffeine and nontheobromine N × 6.25) 2.9%, reducing sugars as invert sugar 5.0%, sucrose 41.0%, crude fiber 0.6%, carbohydrates other than crude fiber (by difference) 56.6%, theobromine 0.27%,[27] caffeine 0.02%.[27] Moisture-free, fat-free, sugar-free basis—ash 6.6%, ash insoluble in acid 0.2%, crude fiber 6.1%.

Calories.—2.47 per gram; 70 per ounce.

HERSHEY'S CHOCLATIER BRAND CHOCOLATE FLAVORED POWDER, a powdered beverage base containing chocolate liquor, roasted cacao beans, dried skimmed milk and pulverized cane sugar.

Analysis (submitted by manufacturer).—Moisture 1.1%, total solids 98.9%, ash 2.9%, ash insoluble in water 1.9%, ash insoluble in acid 0.02%, fat 16.0%, cacao fat 15.9%, milk fat 0.1%, protein (noncaffeine and nontheobromine N × 6.25) 13.6%, sucrose 42.8%, lactose 14.4%, skimmed milk solids 27.4%, crude fiber 0.8%, carbohydrates other than crude fiber (by difference) 65.6%, theobromine 0.4%,[27] caffeine 0.03%. Moisture-free, fat-free, sugar-free, milk solids—free basis—ash 6.3%, ash insoluble in acid 0.2%, crude fiber 6.2%.

Calories.—4.60 per gram; 131 per ounce.

HERSHEY'S BRAND BREAKFAST COCOA, powdered, dried, partially defatted chocolate liquor.

Mayflower Food Products Incorporated, New York.

VEE VO BRAND CHOCOLATE FLAVORED POWDER, a beverage base containing sucrose, breakfast cocoa, malted milk, dried egg yolk (1 per cent), whole milk powder (0.5 per cent) dried malt (0.5 per cent) and sodium chloride, flavored with vanillin.

Analysis (submitted by manufacturer).—Moisture 1.8%, total solids 98.2%, ash 1.7%, fat (ether extract) 7.2%, protein (noncaffeine and nontheobromine N × 6.25) 7.1%, reducing sugar as lactose 9.4%, sucrose 61.4%, crude fiber 1.5%, carbohydrates other than crude fiber (by difference) 80.7%, lipid phosphoric acid (P_2O_5) 0.027%, iron (Fe) 1 mg. per hundred grams, calcium (Ca) 0.18%, phosphorus (P) 0.23%.

Calories.—4.16 per gram; 118 per ounce.

Rockwood and Company, Brooklyn.

ROCKWOOD'S BRAND CHOCOLATE FLAVORED SYRUP, a beverage base containing sucrose, syrup, water, cocoa and sodium bicarbonate (trace), flavored with vanillin and coumarin.

---

27. Calculated A. Prochnow's modification of the Beckurts-Fromme method (Ueber die Bestimmung der Xanthinbasen in Kakao und Schokolade, Arch. d. Pharm. 247: 698, 1909).

Analysis (submitted by manufacturer).—Moisture 39.8%, total solids 60.2%, ash 0.6%, fat (ether extract) 1.2%, protein (N × 6.25) 2.3%, reducing sugar as invert sugar 9.9%, sucrose 39.7%, crude fiber 0.6%, carbohydrates other than crude fiber (by difference) 55.5%, total nitrogen 0.34%, theobromine 0.30%, caffeine 0.05%, pH 5.6.

Calories.—2.42 per gram; 69 per ounce.

ROCKWOOD'S BRAND COCOA, a powdered dried mixture of partially defatted chocolate liquor and "Dutch process" cocoa, flavored with vanillin. It contains less fat than standard cocoa.

ROCKWOOD'S ROCK-CO BRAND COCOA, powdered dried defatted "chocolate liquor," flavored with vanillin. It contains less fat than standard cocoa.

E. R. Squibb & Sons, New York.

VITAVOSE BRAND CHOCOLATE FLAVORED POWDER, a beverage base containing sucrose, malted wheat germ extract (30 per cent; extract of malted wheat germ and U. S. P. malt), cocoa and skimmed milk, flavored with vanilla.

Analysis (submitted by manufacturer).—Moisture 2.8%, total solids 97.2%, ash 2.8%, fat 1.8%, protein (noncaffeine and nontheobromine N × 6.25) 9.6%, caffeine 0.04%, theobromine 0.13%, crude fiber 0.6%, carbohydrates other than crude fiber (by difference) 82.4%, iron (Fe) 4 mg. per hundred grams, copper (Cu) 1.6 mg. per hundred grams, zinc (Zn) 2 mg. per hundred grams.

Calories.—3.84 per gram; 109 per ounce.

Vitamins.—Calculated from the amount of malted wheat germ extract, the product may be expected to contain 2 international units of vitamin B_1 of riboflavin and 3 micrograms (0.9 international unit of vitamin G) per gram; 57 units and 85 micrograms (25.5 international units), respectively, per ounce.

Warfield Chocolate Company, Chicago.

WARFIELD PREMIER BRAND BAKING CHOCOLATE, UNSWEETENED, ground cacao nibs, or chocolate liquor, in cake form.

Stephen F. Whitman & Son, Inc., Philadelphia.

WHITMAN'S BRAND CHOCOLATE FLAVORED SYRUP, a liquid beverage base containing sucrose, cocoa, invert sugar and sodium chloride, flavored with vanillin.

Analysis (submitted by manufacturer)—Moisture 33.6%, total solids 66.4%, ash 1.2%, fat 2.1%, protein (N× 6.25) 5.9%, reducing sugar as invert sugar 50.6%, sucrose 38.7%, crude fiber 0.9%, carbohydrates other than crude fiber (by difference) 56.3%.

Calories.—2.64 per gram; 75 per ounce.

FLAVORING EXTRACTS

Flavor is important in making food more palatable. There are a number of constituents that contribute flavor and zest to food. One class of such food adjuncts comprises flavoring extracts.

Flavoring extracts contain natural flavor or synthetic flavor diluted with alcohol to standard strength. The natural flavoring principles are separated commercially from the flavorless portion of the plant by distillation, pressure or solution in a suitable solvent.

Of the flavoring materials used for sweetened foods vanilla in the form of vanilla extract is the most popular. Vanilla is obtained from the vanilla bean, the leguminous seed of a plant indigenous to Mexico. The bean is picked while still green and is subjected to a sweating process. The care with which this is carried out determines to a large degree the perfection of the

flavor. The flavoring ingredients are extracted by means of alcohol from the ground green bean. According to federal standards, vanilla extract contains the soluble matter of 1 Gm. of vanilla bean per hundred cubic centimeters.

Vanillin is one of the ingredients of vanilla extract. This substance is meta methoxy para hydroxy benzaldehyde and is made synthetically for imitation vanilla flavoring. It is prepared from the eugenol of oil of cloves by oxidation, from guaiacol by treatment with chloroform and sodium hydroxide, from coniferin by oxidation, and by various other processes. The presence of synthetic vanillin must be declared on the label of an accepted food.

Vanirom, the ether of protocatechuic aldehyde, is sometimes substituted for vanillin in the preparation of foods. It has four times the flavoring strength of vanillin. Its presence also must be declared on the label.

Coumarin is another substitute often used in conjunction with vanillin. Coumarin is obtained from the highly aromatic seed known as the tonka, or tonquin, bean. It is also prepared synthetically, and the artificial substance has largely replaced the natural essence as an ingredient of foods. Coumarin has a stronger flavor than vanillin and is chemically unrelated, as it is the anhydride of coumaric acid.

Lemon extract, according to federal standards, contains not less than 5 per cent by volume of oil of lemon. The oil is expressed from lemon skins by pressure. Federal standards require that oil of lemon have an optical rotation at 25 C. of not less than + 60 degrees and contain not less than 4 per cent by weight of citral.

Almond extract contains the oil of almond that has been expressed from almonds by pressure. Oil of almond is sweet and bland. The flavoring principle of the oil is benzaldehyde.

The listed products of the following firms stand accepted:

Certified Extracts, Inc., New York.

CERTIFIED BRAND VANILLA EXTRACT, containing water, ethyl alcohol, cane sugar and extractive matter of Bourbon vanilla beans.

Analysis (submitted by manufacturer).—Vanillin 0.29 Gm. per 100 cc., resins 0.18 Gm. per 100 cc., ash 0.30 Gm. per 100 cc., acidity 50 cc. N/10 per 100 cc., alcohol by volume 35%, lead number (Winton) 0.64.

Fred Fear & Co., Brooklyn.

BURTON'S BRAND ALMOND EXTRACT, containing water, ethyl alcohol and pure oil of almond.

Analysis (submitted by manufacturer).—Water by volume 78.09%, alcohol by volume 20%, oil of almond by volume 1.01%.

BURTON'S BRAND LEMON EXTRACT, containing water, ethyl alcohol, and oil of lemon.

Analysis (submitted by manufacturer).—Water by volume 5%, alcohol by volume 90%, oil of lemon by volume 5%.

BURTON'S BRAND VANILLA EXTRACT, containing water, ethyl alcohol, cane sugar syrup and extractive matter of Mexican and prime Bourbon vanilla beans.

Analysis (submitted by manufacturer).—Vanillin 0.25 Gm. per 100 cc., resins 0.10 Gm. per 100 cc., lead number 0.65, acidity 0.40 cc. N/10 per 100 cc., alcohol by volume 33%.

McCormick and Company, Inc., Baltimore.

McCORMICK'S BEE BRAND LEMON EXTRACT, containing water, alcohol and oil of lemon.

Analysis (submitted by manufacturer).—Water by volume 12.7%, alcohol by volume 80%, oil of lemon by volume 8.0%, citral 0.36 Gm. per 100 cc.

McCORMICK'S BEE BRAND VANILLA EXTRACT, containing water, alcohol, sugar and extractive matter of Mexican vanilla beans.

Analysis (submitted by manufacturer).—Water by volume 60.4%, alcohol by volume 35.0%, total solids 10.8 Gm. per 100 cc., ash 0.4 Gm. per 100 cc., sucrose 5.1 Gm. per 100 cc., vanillin 0.2 Gm. per 100 cc., lead number (Winton) 0.7.

Parke, Davis & Company, Detroit.

PARKE, DAVIS & COMPANY'S BRAND EXTRACT VANILLA SPECIAL, containing water, alcohol, sugar and extractive matter of Bourbon and Tahiti vanilla beans.

Analysis (submitted by manufacturer).—Alcohol by volume 30%, total solids 31.2 Gm. per 100 cc., ash 0.3 Gm. per 100 cc., sucrose 28.0 Gm. per 100 cc., vanillin 0.18-0.19 Gm. per 100 cc., lead number (Winton) 0.35, specific gravity (approximate) 1.08.

The following firms distribute under their own labels products purchased from manufacturers of accepted products now privileged to use the Seal of Acceptance. The labels and advertising conform to the Rules and Decisions of the Council.

Clover Farm Stores Corporation, Cleveland.

CLOVER FARM BRAND VANILLA EXTRACT, containing water, ethyl alcohol, cane sugar and extractive matter of Bourbon vanilla beans.

The Hudson Wholesale Grocery Company, Jersey City, N. J.

FILIGREE BRAND VANILLA EXTRACT, containing water, ethyl alcohol, cane sugar and extractive matter of Bourbon vanilla beans.

DESSERT PRODUCTS

For purposes of this book accepted dessert products may be classified into four groups:

1. Corn starch desserts, consisting of a mixture of sugar or dextrose or both, corn starch, flavoring and food color certified by the United States Department of Agriculture.

2. Gelatin desserts, consisting of sugar, gelatin, tartaric acid or some other approved organic acid, color certified by the United States Department of Agriculture and fruit flavors.

3. So-called ice cream desserts, consisting of a powdered mixture of sugar, skimmed milk powder, vanilla extract, karaya gum, certified color and salt.

4. Rennin powdered desserts, consisting of sufficient rennin for changing a pint of milk into a custard-like dessert in three minutes at 109 F., sugar, assorted flavorings, calcium hypophosphite to promote the clotting of the milk and some stabilizing colloid (tragacanth) and food color certified by the United States Department of Agriculture.

Corn starch dessert products are useful because they simplify the preparation of desserts in the home kitchen. In the manufacturing process the corn starch and sugar are so intimately

mixed that when the liquid is added the starch granules do not adhere together and form little lumps when the pudding is cooked.

The so-called ice cream dessert products are useful in preparation of appetizing frozen desserts in the automatic refrigerator. Directions printed on labels should be followed closely. It is usually necessary to use milk or cream or other ingredients with the powder mixture in order to obtain a dessert. The accepted products contain small amounts of substances such as karaya gum and pectin to prevent the formation of large ice crystals when the product is frozen without being stirred in the freezing tray.

The rennin powdered dessert products are useful with milk in preparation of custard-like milk desserts. While the rennin enzyme does not add to the fuel value of milk, it makes the milk more wholesome because it performs the first step in the natural process of digestion of this food.

The gelatin dessert products contain sugar and sufficient gelatin for the product to gel according to the directions given in the recipe.

The listed products of the following firms stand accepted:

Corn Products Refining Company, New York.

KRE-MEL BRAND DESSERT POWDER, CARAMEL FLAVOR, containing a mixture of dextrose, corn starch, sucrose, caramel and vanillin.

KRE-MEL BRAND DESSERT POWDER, CHOCOLATE FLAVOR, containing a mixture of dextrose, corn starch, sucrose, cocoa and vanillin.

KRE-MEL BRAND DESSERT POWDER, COFFEE FLAVOR, containing a mixture of dextrose, corn starch, sucrose, vanillin and coffee.

KRE-MEL BRAND DESSERT POWDER, VANILLIN FLAVOR, containing a mixture of dextrose, corn starch, sucrose, vanillin and color certified by the United States Department of Agriculture.

General Foods Corporation, New York, product distributed by The Jell-O Company, Inc., LeRoy, N. Y.

JELL-O BRAND GELATIN DESSERT, CHERRY FLAVOR, containing a mixture of cane sugar, gelatin, tartaric or citric acid, fruit flavor and color certified by the United States Department of Agriculture.

JELL-O BRAND GELATIN DESSERT, ORANGE FLAVOR, containing a mixture of cane sugar, gelatin, tartaric or citric acid, fruit flavor and color certified by the United States Department of Agriculture.

JELL-O BRAND GELATIN DESSERT, LEMON FLAVOR, containing a mixture of cane sugar, gelatin, tartaric or citric acid, fruit flavor and color certified by the United States Department of Agriculture.

JELL-O BRAND GELATIN DESSERT, LIME FLAVOR, containing a mixture of cane sugar, gelatin, tartaric or citric acid, fruit flavor and color certified by the United States Department of Agriculture.

JELL-O BRAND GELATIN DESSERT, RASPBERRY FLAVOR, containing a mixture of cane sugar, gelatin, tartaric or citric acid, fruit flavor and color certified by the United States Department of Agriculture.

JELL-O BRAND GELATIN DESSERT, STRAWBERRY FLAVOR, containing a mixture of cane sugar, gelatin, tartaric or citric acid, fruit flavor and color certified by the United States Department of Agriculture.

The Great Atlantic & Pacific Tea Company, New York. *See* Quaker Maid Company, New York.

Chr. Hansen's Laboratory, Inc., Little Falls, N. Y.

JUNKET BRAND RENNIN POWDER, CHOCOLATE FLAVOR, containing sucrose, calcium hypophosphite ($2CaHPO_4.3H_2O$), vegetable gum (tragacanth or acacia), rennin and cocoa.

JUNKET BRAND RENNIN POWDER, LEMON FLAVOR, containing sucrose, calcium hypophosphite ($2CaHPO_3.3H_2O$), vegetable gum (tragacanth or acacia), rennin, oil of lemon and color certified by the United States Department of Agriculture.

JUNKET BRAND RENNIN POWDER, ORANGE FLAVOR, containing sucrose, calcium hypophosphite ($2CaHPO_3.3H_2O$), vegetable gum (tragacanth or acacia), rennin, oil of orange and color certified by the United States Department of Agriculture.

JUNKET BRAND RENNIN POWDER, RASPBERRY FLAVOR, containing sucrose, calcium hypophosphite ($2CaHPO_3.3H_2O$), vegetable gum (tragacanth or acacia), rennin, raspberry oil and color certified by the United States Department of Agriculture.

JUNKET BRAND RENNIN POWDER, VANILLA FLAVOR, containing sucrose, calcium hypophosphite ($2CaHPO_3.3H_2O$), vegetable gum (tragacanth or acacia), rennin and vanilla extract.

JUNKET BRAND RENNIN TABLETS, containing sodium chloride, starch, calcium phosphate and rennin.

The Jell-O Company, Inc., LeRoy, N. Y. *See* General Foods Corporation, New York.

Jell-Well Dessert Company, Ltd., Los Angeles.

JELL-WELL BRAND GELATINE DESSERT, WILD CHERRY FLAVOR, containing sugar, gelatin, tartaric acid, sodium chloride, potassium bitartrate, natural cherry flavor and food color certified by the United States Department of Agriculture. The flavor is sealed in cubes of sugar.

JELL-WELL BRAND GELATINE DESSERT, CONCORD GRAPE FLAVOR, containing sugar, gelatin, tartaric acid, sodium chloride, potassium bitartrate, concord grape concentrate and food color certified by the United States Department of Agriculture. The flavor is sealed in cubes of sugar.

JELL-WELL BRAND GELATIN DESSERT, LEMON FLAVOR, containing sugar, gelatin, tartaric acid, sodium chloride, potassium bitartrate, natural oil of lemon and food color certified by the United States Department of Agriculture. The flavor is sealed in cubes of sugar.

JELL-WELL BRAND GELATIN DESSERT, LIME FLAVOR, containing sugar, gelatin, tartaric acid, sodium chloride, potassium bitartrate, natural lime flavor and food color certified by the United States Department of Agriculture. The flavor is sealed in cubes of sugar.

JELL-WELL BRAND GELATIN DESSERT, ORANGE FLAVOR, containing sugar, gelatin, tartaric acid, sodium chloride, potassium bitartrate, natural oil of orange and food color certified by the United States Department of Agriculture. The flavor is sealed in cubes of sugar.

JELL-WELL BRAND GELATINE DESSERT, RASPBERRY FLAVOR, containing sugar, gelatin, tartaric acid, sodium chloride, potassium bitartrate, natural raspberry flavor and food color certified by the United States Department of Agriculture. The flavor is sealed in cubes of sugar.

JELL-WELL BRAND GELATINE DESSERT, STRAWBERRY FLAVOR, containing sugar, gelatin, tartaric acid, sodium chloride, potassium bitartrate, natural strawberry flavor and food color certified by the United States Department of Agriculture. The flavor is sealed in cubes of sugar.

Charles B. Knox Gelatine Company, Johnstown, N. Y.

KNOX-JELL BRAND GELATINE DESSERT, LEMON FLAVOR, containing sucrose, gelatin, citric or tartaric acid, terpeneless oil of lemon and food color certified by the United States Department of Agriculture.

KNOX-JELL BRAND GELATINE DESSERT, LIME FLAVOR, containing sucrose, gelatin, citric or tartaric acid, terpeneless oil of lime and certified food color or vegetable color.

KNOX-JELL BRAND GELATINE DESSERT, ORANGE FLAVOR, containing sucrose, gelatin, citric or tartaric acid, terpeneless oil of orange and certified food color or vegetable color.

KNOX-JELL BRAND GELATINE DESSERT, RASPBERRY FLAVOR, containing sucrose, gelatin, citric or tartaric acid, raspberry extract, and certified food color or vegetable color.

KNOX-JELL BRAND GELATINE DESSERT, STRAWBERRY FLAVOR, containing sucrose, gelatin, citric or tartaric acid, strawberry extract and certified food color or vegetable color.

Quaker Maid Company, Inc., New York, product distributed by The Great Atlantic and Pacific Tea Company, New York.

ANN PAGE SPARKLE BRAND CHOCOLATE FLAVORED PUDDING, a powdered mixture of sucrose, corn starch, cocoa, dried skimmed milk, sodium chloride and vanillin.

ANN PAGE SPARKLE BRAND VANILLA PUDDING, a powdered mixture of sucrose, dextrose, corn starch, arrowroot starch, sodium chloride, vanilla extract and food color certified by the United States Department of Agriculture.

ANN PAGE SPARKLE BRAND VANILLA ICE CREAM DESSERT POWDER, a powdered mixture of sugar, dried skimmed milk, karaya gum, sodium chloride, vanilla extract and color certified by the United States Department of Agriculture.

ANN PAGE SPARKLE BRAND CHOCOLATE FLAVORED ICE CREAM DESSERT POWDER, a powdered mixture of sugar, cocoa, karaya gum and sodium chloride.

SPARKLE BRAND GELATIN DESSERT, CHERRY FLAVOR, containing sucrose, gelatin, tartaric acid, natural concentrated cherry flavor and food color certified by the United States Department of Agriculture.

SPARKLE BRAND GELATIN DESSERT, COFFEE FLAVOR, containing sucrose, gelatin, coffee extract and sodium chloride.

SPARKLE BRAND GELATIN DESSERT, LEMON FLAVOR, containing sucrose, gelatin, tartaric acid, terpeneless oil of lemon and food color certified by the Untied States Department of Agriculture.

SPARKLE BRAND GELATIN DESSERT, LIME FLAVOR, containing sucrose, gelatin, tartaric acid, distilled oil of lime and food color certified by the United States Department of Agriculture.

SPARKLE BRAND GELATIN DESSERT, ORANGE FLAVOR, containing sucrose, gelatin, tartaric acid, terpeneless oil of orange and food color certified by the Untied States Department of Agriculture.

SPARKLE BRAND GELATIN DESSERT, RASPBERRY FLAVOR, containing sucrose, gelatin, tartaric acid, natural concentrated raspberry flavor and food color certified by the United States Department of Agriculture.

SPARKLE BRAND GELATIN DESSERT, STRAWBERRY FLAVOR, containing sucrose, gelatin, tartaric acid, natural concentrated strawberry flavor and food color certified by the United States Department of Agriculture.

BAKING POWDER, CREAM OF TARTAR AND BAKING SODA

Baking powder is not strictly a food, as its function is to leaven dough and thus to increase the palatability of the cooked product. All baking powders consist of starch, sodium bicarbonate ($NaHCO_3$) and an acid constituent. The starch is added to improve the keeping power and to standardize the amount of carbon dioxide liberated. Sodium bicarbonate is the only practical source of carbon dioxide now available for baking powder. Several acid-reacting materials are now used in the manufacture of baking powders, namely, potassium bitartrate ($KHC_4H_4O_6$; cream of tartar), tartaric acid ($C_2H_4O_2[COOH]_2$), monocalcium phosphate ($CaH_4[PO_4]_2$), disodium pyrophosphate ($Na_2H_2P_2O_7$) and sodium aluminum sulfate ($Na_2Al_2[SO_4]_4$; soda. alum).

Potassium bitartrate acts less rapidly on sodium bicarbonate than tartaric acid; hence a suitable mixture of the two causes a more prolonged evolution of gas, which is regarded as desirable in leavening doughs. Baking powders containing these constituents are known as tartrate baking powders. A powder containing 27 per cent sodium bicarbonate either with 24 per cent tartaric acid and 49 per cent starch or with 60 per cent

potassium bitartrate and 13 per cent starch may be expected to yield about 14 per cent carbon dioxide.

Calcium monophosphate, or calcium acid phosphate, is the acid constituent in the so-called phosphate baking powders; it is also used together with an equivalent amount of sodium bicarbonate in the manufacture of self rising flour and ready mixed cake preparations. In recent years it has become a practice to substitute disodium pyrophosphate for monocalcium phosphate in baking powders prepared for commercial bakers.

A powder containing 27 per cent sodium bicarbonate, 35 per cent monocalcium phosphate and 38 per cent starch may be expected to yield about 14 per cent carbon dioxide. All the usual types of baking powder are so made as to have this leavening power.

At the present time "straight" alum (sodium aluminum sulfate) baking powders are seldom found on the market. A combination of calcium monophosphate and sodium aluminum sulfate is used.

There has been considerable controversy over the harmfulness of the residues left by the different types of baking powder. Powders which contain potassium bitartrate and tartaric acid are generally believed to leave a residue of potassium sodium tartrate ($KNaC_4H_4O_6$; Rochelle salt) and sodium tartrate in the food product. The combination powders are believed to leave a residue of sodium sulfate and disodium phosphate. The alum baking powders consisting of sodium bicarbonate and sodium aluminum sulfate ($Na_2Al_2[SO_4]_4$) yield aluminum hydroxide [$Al(OH)_3$], sodium sulfate and carbon dioxide. The human body can excrete these substances in the amounts ordinarily obtained from foods without difficulty. The idea that baked products made with baking powder are harmful is, in the opinion of the Council, without foundation.

The Council on Foods has accepted several brands of combination type baking powders and one brand of the phosphate type.

The listed products of the following firms stand accepted:

Calumet Baking Powder Company, Inc., Chicago. *See* General Foods Corporation, New York.

R. B. Davis Company, Hoboken, N. J.

DAVIS OK BRAND BAKING POWDER, containing corn starch, sodium bicarbonate ($NaHCO_3$), monocalcium phosphate ($CaH_4[PO_4]_2.H_2O$), sodium aluminum sulfate ($Na_2Al_2[SO_4]_4$) and a small quantity of dried white of egg.

General Foods Corporation, New York, product distributed by Calumet Baking Powder Company, Inc., Chicago.

CALUMET BRAND BAKING POWDER, containing corn starch, sodium bicarbonate ($NaHCO_3$), sodium aluminum sulfate ($Na_2Al_2[SO_4]_4$), monocalcium phosphate ($CaH_4[PO_4]_2.H_2O$) and 0.15 per cent dried white of egg.

Products distributed by The Snow King Baking Powder Company, Cincinnati.

SNOW KING DOUBLE ACTING BRAND BAKING POWDER, containing corn starch, sodium bicarbonate ($NaHCO_3$), sodium aluminum sulfate ($Na_2Al_2[SO_4]_4$) and monocalcium phosphate ($CaH_4[PO_4]_2.H_2O$).

SNOW KING BAKING SODA, sodium bicarbonate ($NaHCO_3$) fulfilling U. S. P. requirements.

TEXAS GIRL DOUBLE ACTING BRAND BAKING POWDER, containing corn starch, sodium bicarbonate ($NaHCO_3$), sodium aluminum sulfate ($Na_2Al_2[SO_4]_4$) and monocalcium phosphate ($CaH_4[PO_4]_2.H_2O$).

Product distributed by the Dairy Maid Division of the Snow King Baking Powder Company, Cincinnati.

DAIRY MAID BRAND BAKING POWDER, same as Snow King Double Acting Brand Baking Powder.

DAIRY MAID BAKING SODA, same as Snow King Baking Soda.

Griffin Grocery Co., Muskogee, Okla., product distributed by Hi-Lo Baking Powder Company, Muskogee, Okla.

HI-LO DOUBLE ACTING BRAND BAKING POWDER, containing corn starch, sodium bicarbonate ($NaHCO_3$), sodium aluminum sulfate ($Na_2Al_2[SO_4]_4$), and monocalcium phosphate ($CaH_4[PO_4]_2\ H_2O$).

McCormick & Company, Inc., Baltimore.

MCCORMICK'S BEE BRAND CREAM OF TARTAR, potassium acid tartrate ($KHC_4H_4O_6$) fulfilling U. S. P. requirements.

Rumford Chemical Works, Rumford, R. I.

RUMFORD BRAND BAKING POWDER, containing corn starch, sodium bicarbonate ($NaHCO_3$) and monocalcium phosphate ($CaH_4[PO_4]_2.H_2O$).

Sandy Valley Grocery Co., Ashland and Paintsville, Ky.

S-V BRAND DOUBLE ACTION BAKING POWDER, containing corn starch, sodium bicarbonate ($NaHCO_3$), sodium aluminum sulfate ($Na_2Al_2[SO_4]_4$ and monocalcium phosphate ($CaH_4[PO_4]_2.H_2O$).

The Snow King Baking Powder Company, Chicago. *See* General Foods Corporation, New York.

WATER

Approximately 60 per cent of the body is water. While man can live for days or even weeks without food, he cannot live without water. Water is constantly being eliminated by the skin, lungs and kidneys; hence this loss must be replaced by some means. This is most conveniently done by drinking water.

The daily water requirements for health cannot be defined with any degree of exactness, as activity, temperature and other conditions influence the demands. Sufficient water should be taken with meals and between meals to satisfy thirst. Glutting the body with water is not justified. Under disease conditions the physician should prescribe the water intake.

Allowable Claims for Mineral, Spring, Natural or Alkaline Waters.—Mineral, spring, natural and alkine waters are usually advertised with unwarranted claims as to their health values. These waters are often alleged to possess curative and medicinal properties.

Analyses of most of these waters do not disclose explanations or evidence of remarkable curative properties. In case of potable mineral waters their mineral content comprises only traces of commonly occurring salts, which are present in substantially greater quantities in ordinary foods. In many cases the deceptive therapeutic claims are the result of hearsay and illusion or of deliberate scheming to defraud. Mineral waters having therapeutic action, generally cathartic, usually contain salts such as sodium phosphate or magnesium sulfate. Such therapeutically active mineral waters come under the purview of the Council on Pharmacy and Chemistry.

Formerly, therapeutic properties were attributed to mineral waters containing lithium or possessing radioactivity. Such characteristics of drinking water as radioactivity or the presence of lithium have not been shown to have useful effects. Strongly radioactive waters may be distinctly harmful. Natural waters contain only traces of lithium. The fortification of waters with lithium salts has no rational foundation; larger doses of lithium may be dangerous.

Spring waters of low mineral content are not to be distinguished physiologically from ordinary potable tap or drinking water; their properties for meeting the water needs of the body are the same. Drinking water should be pleasing to the taste and free from contamination that may produce disease. Therapeutic or curative claims for mineral waters that are not laxative are to be viewed with suspicion.

Good bottled waters of uniform composition, of tested purity and freedom from pathogenic contamination at the source and protected from possible contamination during transit to the consumer have special usefulness; they serve as refreshing, pleasing drinking water with a maximum assurance of safety and merit the support of popular and professional advertising appropriate for pure potable water.

The listed products of the following firms stand accepted:

Artisana Water Company, Phoenix, Ariz.

ARTISANA BRAND DISTILLED WATER.

Sanitary Analysis (submitted by manufacturer; parts per million).—Sediment none, turbidity none, odor none, color none, total solids 4.0, nitrogen as free ammonia 0.08, total organic nitrogen 0.31, nitrites 0.000, nitrates 0.000, oxygen consumed 0.000, total chlorine 0.000, hardness (soap method) 2.0.

Micro-Organisms (data submitted by manufacturer).—Total bacteria per cubic centimeter at 20 C. less than 1, at 37 C. less than 1. No evidence of the presence of organisms of the Bacillus coli group.

ARTISANA BRAND WELL WATER.

Sanitary Analysis (submitted by manufacturer; parts per million).—Sediment none, turbidity none, odor none, color none, total solids 180.0, nitrogen as free ammonia 0.000, total organic nitrogen 0.28, nitrites 0.000, nitrates 5,000, oxygen consumed 0.000, total chlorine 41.7, hardness (soap method) 42.0.

Chemical Analysis (submitted by manufacturer; parts per million).—Total soluble salts 403, sodium 32, calcium 37, magnesium 34, chlorides 72, sulfates 40, carbonates 2, bicarbonates 188, fluorine 0.3; p_H 7.8.

Micro-Organisms (data submitted by manufacturer).—Bacteria per cubic centimeter at 20 C. 7, at 37 C. 15. Organisms of the coli group in 50 cc. none.

California Consolidated Water Co., Los Angeles.

ARROWHEAD BRAND SOFT SPRING WATER.

Sanitary Analysis (submitted by manufacturer; parts per million).—Turbidity none, color none, odor none, oxygen consumed 0.02, oxygen dissolved 8.5, free carbon dioxide 0.2, nitrogen as free ammonia none, organic nitrogen none, nitrites none, nitrates none.

Chemical Analysis (submitted by manufacturer; parts per million).—Residue on evaporation 94.0, loss on ignition 29.0, chloride 2.5, phosphate trace, iron 0.08, calcium 14.7, magnesium 1.3, silica 17.3, sulfate 0.26, bicarbonate 61.9, sodium 11.0, potassium 0.9, metaborate none, arsenate none, bromide none, iodide none, manganese none.

Micro-Organisms (data submitted by manufacturer).—None or very few bacteria per cubic centimeter and no organisms of the B. coli group.

PURITAS BRAND CALIFORNIA DISTILLED WATER.

Sanitary Analysis (submitted by manufacturer; parts per million).—Turbidity none, color none, odor none, oxygen consumed none, oxygen dissolved 8.4, free carbon dioxide 0.15, nitrogen as free ammonia none, organic nitrogen none, nitrites none, nitrates none.

Chemical Analysis (submitted by manufacturer; parts per million).—Residue on evaporation 0.0, loss on ignition 1.0, bicarbonate 0.30, negative reactions to tests for metals and acid radicals.

Micro-Organisms (data submitted by manufacturer).—None or very few bacteria per cubic centimeter and no organisms of the coli group.

Hinckley and Schmitt, Chicago.

CORINNIS BRAND WAUKESKA SPRING WATER.

Sanitary Analysis (submitted by manufacturer; parts per million).—Appearance clear, color none, sediment none, oxygen consumed 0.6, nitrogen as free ammonia 0.060, organic nitrogen 0.014, nitrites 0.002, nitrates 0.060.

Chemical Analysis (submitted by manufacturer; parts per million).—Total solids 340.0, mineral matter 306.0, organic and volatile matter 34.0, hardness before boiling 220.0, hardness after boiling 47.0, sulfuric anhydride 45.3, silica 7.0, chlorine in chlorides 8.0, iron and aluminum oxides 2.4, iron 0.1, calcium 66.7, magnesium 23.8, lithium trace, reaction after boiling faintly alkaline.

Micro-Organisms (data submitted by manufacturer, average of 50 examinations of samples taken at the source).—Bacteria per cubic centimeter at 37 C. in 24 hours 0.1, at 20 C. in 48 hours 0.6. Result of B. coli test, fermentation in lactose broth for 72 hours, negative. Bacteria per cubic centimeter (average of 100 examinations of samples taken from tank cars) at 37 C. in 24 hours 0.5, at 20 C. in 48 hours 0.8. Result of B. coli test, fermentation in lactose broth for 72 hours, negative. Official plate count, 4 bacteria per cubic centimeter. Tests showed no acid or gas produced with lactose broth.

Hiram Ricker and Sons, Inc., South Poland, Maine.

POLAND BRAND NATURAL SPRING WATER.

Sanitary Analysis (submitted by manufacturer; parts per million).—Sediment none, turbidity none, color 5.0.

Chemical Analysis (submitted by manufacturer; parts per million).—Residue on evaporation 110, nitrogen as free ammonia 0.01, organic nitrogen 0.01, nitrites 0 002, nitrates 0.36, oxygen consumed 0.1, chlorine 6.0, hardness 5.8, free carbon dioxide 12.0, silicon 8.1, iron 0.1, aluminum 0.5, copper none, calcium 9.7, lead none, magnesium 1.7, sodium 5.1, potassium 1.5, sodium chloride 5.0, sulfur 3.2, phosphorus trace.

Micro-Organisms (data submitted by manufacturer).—Total bacteria per cubic centimeter at 20 C 11, at 37.5 C. 1. Acid colonies per cubic centimeter 0. Result of presumptive test for B. coli in 10 cc. negative. Result of confirmative test for B. coli negative. Organisms of the B. coli group in 50 cc. none.

Mineral Waters, Inc., Harrison, Maine.

SUMMIT BRAND MINERAL SPRING WATER.

Sanitary Analysis (submitted by manufacturer; parts per million).—Turbidity none, color none, sediment slight vegetable, odor at 20 C. very faint vegetable, nitrogen as free ammonia 0.004, organic nitrogen 0.016, nitrites trace, nitrates 0.3, hardness 13, alkalinity (p_H) 7.0, chlorine 1.0.

Chemical Analysis (submitted by manufacturer; parts per million).—Silica 2202, sodium nitrate 1.645, potassium chloride 0.657, sodium chloride 4.424, sodium sulfate 2.353, sodium carbonate 12.587, magnesium carbonate 7.536, calcium carbonate 6.782, iron oxide 0.097, aluminum oxide 7.266, organic and volatile matter 14.0.

Micro-Organisms (data submitted by manufacturer).—Bacteria per cubic centimeter at 37.5 C. 32. Organisms of the coli group absent.

Waukesha Roxo Company, Milwaukee.

WAUKESHA ROXO BRAND MINERAL SPRING WATER.

Sanitary Analysis (submitted by manufacturer; parts per million).—Free ammonia 0.01, organic nitrogen 0.01, nitrites none, nitrates 6.

Chemical Analysis (submitted by manufacturer; parts per million).—Total residue on evaporation 610, fixed residue after ignition 368, free carbon dioxide 22, carbon dioxide combined as bicarbonate 246, carbon dioxide combined as carbonate none, aluminum 6, boron none, calcium 111, iron 0.1, magnesium 51, potassium 1, sodium 26, bicarbonate 341, chloride 31, nitrate 26, phosphate none, silica 12, sulfate 116.

Micro-Organisms (data submitted by manufacturer).—Only a few harmless micro-organisms in the water.

PEANUT BUTTER

Peanut butter is obtained by grinding roasted peanuts to a paste. It is used as a spread for bread as well as an ingredient in cakes and candy. The peanut is the oily seed of a leguminous plant, Arachis hypozaca leguminosa, which is indigenous to Brazil. Peanuts are now widely grown in the United States.

The listed products of the following firms stand accepted:

Canova Foods, Inc., Memphis, Tenn.

CANOVA BRAND PEANUT BUTTER, ground Spanish and Virginia peanuts seasoned with sodium chloride.

Analysis (submitted by manufacturer).—Moisture 1.7%, ash 2.2%, fat (ether extract) 48.3%, protein (N × 6.25) 31.4%, crude fiber 2.0%, carbohydrates other than crude fiber (by difference) 14.4%.

Calories.—6.2 per gram; 176 per ounce.

Oswego Candy Works, Inc., Oswego, N. Y.

LONG'S OX-HEART BRAND PEANUT BUTTER, ground peanuts seasoned with sodium chloride.

Analysis (submitted by manufacturer).—Moisture 2.8%, ash 2.8%, fat (ether extract) 50.9%, protein (N × 6.25) 28.8%, crude fiber 2.3%, carbohydrates other than crude fiber (by difference) 12.4%.

Calories.—6.2 per gram; 176 per ounce.

Rose Field Packing Company, Ltd., Alameda, Calif.

SKIPPY BRAND PEANUT BUTTER, ground peanuts, the oil of which has been extracted, hydrogenated and then mixed with the peanuts.

Analysis (submitted by manufacturer).—Moisture 0.4%, ash 3.1%, fat (ether extract) 49.1%, protein (N × 6.25) 30.8%, crude fiber 0.9%, carbohydrates other than crude fiber (by difference) 11.3%.

Calories.—6.3 per gram; 179 per ounce.

OLIVES

Olives are the fruit of the olive tree. As picked from the tree they are extremely bitter. It is necessary to soak them in an alkaline solution (1.6 to 2.0 per cent lye) with frequent change of water to remove this bitter taste. After being soaked in the lye solution, the olives are soaked in 11 per cent brine, washed and canned. Heat processing at 114 C. is necessary in order that pathogenic and spoilage organisms may be destroyed.

The listed products of the following firm stand accepted:

Ehmann Olive Company, Oroville, Calif.

EHMANN BRAND RIPE OLIVES, MEDIUM, canned ripe olives in brine.

Analysis (submitted by manufacturer).—The edible portion of the drained olive is 81 per cent of the entire olive).—Moisture 73.5%, total solids 26.5%, ash 2.3%, fat 18.6%, protein (N × 6.25) 1.3%, crude fiber 1.8%, carbohydrates other than crude fiber (by difference) 2.5%.

Calories.—1.8 per gram; 51 per ounce.

EHMANN BRAND RIPE OLIVES, LARGE, canned ripe olives in brine.

Analysis.—Same as Ehmann Brand Ripe Olives, Medium.

EHMANN BRAND RIPE OLIVES, EXTRA LARGE, canned ripe olives in brine. Same as Ehmann Brand Ripe Olives, Medium.

EHMANN BRAND RIPE OLIVES, MAMMOTH, canned ripe olives in brine. *Analysis* (submitted by manufacturer; edible portion of drained olive).—Moisture 82.5%, total solids 17.5%, ash 2.1%, fat 9.1%, protein (N × 6.25) 1.3%, crude fiber 2.6%, carbohydrates other than crude fiber (by difference) 2.4%.

Calories.—1.0 per gram; 28 per ounce.

EHMANN BRAND RIPE OLIVES, GIANT, canned ripe olives in brine. *Analysis.*—Same as Ehmann Brand Ripe Olives, Mammoth.

EHMANN BRAND RIPE OLIVES, JUMBO, canned ripe olives in brine. *Analysis.*—Same as Ehmann Brand Ripe Olives, Mammoth.

EHMANN BRAND RIPE OLIVES, COLOSSAL, canned ripe olives in brine. *Analysis.*—Same as Ehmann Brand Ripe Olives, Mammoth.

COTTONSEED FLOUR

Commercial cottonseed flour, treated to destroy a toxic substance naturally present in the seed (gossypol), was first introduced as a food for human consumption about 1910.[28] Its use received an impetus during the world war of 1914-1918.[29] Today cottonseed flour is a food item of some importance, especially in some of the southern states.

One process [30] for preparing cottonseed flour from cottonseed meal is known as the Baumgarten process, and consists essentially of cooking the meal for about two hours at a temperature of about 115 C., expressing the liquid from the cooked material and drying the solid residue. This residue, when thoroughly dried, is ground and bolted to produce a flour suitable for use as an addition to wheat flour in making baked goods.

Another process of preparing flour from cottonseed meal is known as the McMath process.[31] In this process the decorticated seeds are pulverized and cooked in a definite quantity of water for from seventy to ninety minutes in steam-jacketed cookers. The temperature during the first fifteen minutes is raised rapidly to 102 C., then gradually to 108 C. The cooked material is defatted in hydraulic presses to about nine per cent fat content; the resulting cake is ground and the flour separated by air flotation.

It has been known for some years that autoclaving cottonseed meal for a period of several hours at 15 to 20 pounds pressure inactivates, or renders non-toxic, the gossypol which is present. When properly prepared cottonseed flour can be used in any amount which can be comfortably eaten without injurious effects.

Cottonseed flour is chiefly used in baking. As it does not contain the gluten-forming constituents that give bread-making

28. Fraps, G. S.: Cottonseed Meal as Human Food, Bulletin 122, Texas Agricultural Experiment Station, College Station, Texas (March) 1910.

29. Richardson, A. E.: Cottonseed Flour as a Human Food, Bulletin 1727, University of Texas, Austin, Texas (May 10) 1917.

30. Baumgarten, G. A.: United States Patent 1,276,477, Aug. 20, 1918.

31. United States patent 2,064,158, Dec. 15, 1936.

value to wheat flour, it is generally used in combinations with wheat flour. Cottonseed flour can be substituted for about one-fifth of the wheat flour in various kinds of bread and baked products. This combination makes a darker bread with a "nutty" flavor. Although cottonseed flour was originally prepared for use as an addition to the human dietary it has been found to be well adopted to many other uses, such as the manufacture of plastics, emulsion stabilizers and other non-dietary products.

Composition and Nutritive Value of Cottonseed Flour.—Cottonseed flour contains from 6 to 8 per cent moisture, 6 per cent ash, 50 to 55 per cent protein, 7 to 11 per cent fat, 2 to 4 per cent crude fiber, and about 23 per cent carbohydrates other than crude fiber by difference. The protein of cottonseed flour is similar to that of other oily seeds in that it is complete for growth purposes.[32]

Cottonseed flour contains some vitamin B_1 and vitamin G (riboflavin). According to Munsell and DeVaney[33] cottonseed flour contains about 2.33 international units of vitamin B_1 and 1.7 Sherman Bourquin units of vitamin G per gram. Cottonseed flour contains a small amount of the "pellagra-preventive vitamin," but Sebrell and Hunt[34] have shown that the quantity present is too small for the material to be of any practical value in the treatment and prevention of pellagra.

The listed products of the following firms stand accepted.

The Schulenburg Oil Mill, Schulenburg, Texas.

ALLISON BRAND COTTONSEED FLOUR (BAUMGARTEN'S PROCESS), partially defatted, cooked cottonseed flour free from the toxic form of gossypol.

Analysis (submitted by manufacturer).—Moisture 6.3%, total solids 93.7%, ash 5.8%, fat (ether extract) 11.0%, protein (N × 6.25) 50.2%, crude fiber 3.9%, carbohydrates other than crude fiber (by difference) 22.8%.

Calories.—3.9 per gram; 111 per ounce.

Traders Oil Mill Company, Fort Worth, Texas.

COFLO BRAND COTTONSEED FLOUR (MCMATH PROCESS), partially defatted, cooked cottonseed flour free from the toxic form of gossypol.

Analysis (submitted by manufacturer).—Moisture 8%, total solids 92.0%, ash 5.5%, fat (ether extract) 7.0%, protein (N × 6.25) 54%, crude fiber 2.0%, carbohydrates other than crude fiber (by difference) 23.5%.

Calories.—3.73 per gram; 106 per ounce.

---

32. Macy, I. G., and Mendel, L. B.: Comparative Studies on the Physiological Value and Toxicity of Cottonseed and Some of Its Products, J. Pharmacol. **16**: 345, 1920. Macy, I. G.: Historical Notes on Cottonseed as Food, J. Dairy Science **4**: 250, 1921. Macy, I. G., and Alter, N. M.: The Results of Feeding Cottonseed Meal and Kernels, Am. J. Physiol. **55**: 304, 1921. Macy, I. G. and Outhouse, J. P.: Cottonseed-Meal Injury, Am. J. Physiol. **69**: 78, 1924.

33. Munsell, H. E., and DeVaney, G. M.: The Vitamin B and G Content of Wheat Germ, Rice Polishings, Cottonseed Flour and the Residue from Fermented Rye Grains, Cereal Chemistry **10**: 287 (July) 1933.

34. Sebrell, W. H., and Hunt, D. J.: The Blacktongue Preventive Value of Foodstuffs, United States Treasury Department Public Health Reports **50**: 1333 (Sept. 27) 1935.

Manufacturers and Distributors

General Index

PAGE

Printed and Published in the United States of America